DATA QUALITY AND SUMMARY STATISTICS

FLUME DATA

Annual Report 2012

This report complements the data available on the data portal and is designed to help users by giving an overview of the quality and key statistics of the flume data.

Data Version: 3

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BBSRC bioscience for the future

ROTHAMSTED RESEARCH

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1 15 MINUTE DATA

- Catchments arranged from largest to smallest across tables (left to right) for each farmlet.
- Where PLC switch = 0, this refers to timesteps when flume flow was <0.2 l/s (flow conditions not met) and so the pump is not activated to fill the by-pass flow cell. Therefore, flume data are considered invalid and are classified as missing values ('NA') in the quality control process.
- Where PLC switch = 1, flume flow is >0.2 l/s (flow conditions met) and so the pump is activated to fill the by-pass flow cell.
- For further explanation, refer to Sections 3.3 & 7.1.2 in the 'User Guide to 15 Minute Data' (FP_UG.Doc.002_15MinData) available on the Farm Platform website: http://resources.rothamsted.ac.uk/farm-platform-national-capability/data-portal-guides-and-information

1.1 Counts of PLC switch settings

	Catchment Number														
Variable	**Green**					**Blue**					**Red**				
	4	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
PLC Switch = NA (missing)	26304	26304	26304	26304	26328	26309	26304	26304	26304	26304	26304	26304	26304	26304	26304
PLC Switch = 0 (no flow)	92	997	455	7257	5812	651	2386	2740	5289	5829	2062	382	0	4636	2101
PLC Switch = 1 (flow)	8739	7834	8376	1574	2995	8175	6445	6091	3542	3002	6769	8449	8831	4195	6730

Table 1: Counts of PLC switch settings - missing data, no flow, flow

1.2 Zero values

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Flow	l/s	2710	5205	6878	8165	7801	6418	5711	7519	7955	7576	5901	5112	4665	7966	7500
Nitrate+nitrite	mg/l	4040	1090	3017	1037	2138	820	5055	1799	69	1254	2268	1140	2048	311	1144
Ammonia	mg/l	8645	5855	6929	1573	2390	7700	6429	6088	3525	2367	6696	7493	7714	4195	5998
Ammonium	mg/l	8327	5798	8338	1487	2389	7456	6420	5906	3518	2366	5021	6951	5916	4103	6717
Conductivity	uS/cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dissolved oxygen	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pH	unitless	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flow cell water temperature	°C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turbidity	FNU	440	44	2803	5	0	0	0	0	1	0	52	12	0	38	1069
Total phosphorus	mg/l	NA	1240	NA	NA	NA	NA	1234	NA	NA	NA	1337	NA	NA	NA	NA
Dissolved organic matter	ug/l QSU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ortho-phosphorus	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2: Number of zero values (out of 35135)

1.3 Missing values

1.3.1 Total number of missing values

Variable	Catchment Number														
	Green					Blue					Red				
	4	5	6	12	13	9	8	7	11	14	2	3	1	10	15
Flow	26312	26304	26304	26304	26328	26309	26304	26304	26304	26304	26304	26304	26304	26307	26304
Nitrate+nitrite	27258	27468	28642	33609	32203	27556	29252	29182	31634	33319	28774	26909	27713	31000	28602
Ammonia	26490	29280	28206	33562	32745	27435	28706	29047	31610	32768	28439	27642	27421	30940	29137
Ammonium	26491	29280	26797	33562	32745	27435	28706	29047	31610	32768	28439	27642	27421	30940	28410
Conductivity	26684	29280	26797	33563	32745	27435	28706	29047	31611	32768	28567	27642	27421	30940	28410
Dissolved oxygen	26490	29280	28206	33562	32750	27435	28706	29047	31610	32768	28439	27642	27421	30940	29137
pH	26490	29280	26797	33562	32745	27435	28706	29047	31610	32768	28439	27642	27421	30940	28410
Flow cell water temperature	26490	29280	26797	33562	32745	27435	28706	29047	31610	32768	28439	27642	27421	30940	28410
Turbidity	26490	29280	26952	33562	32745	27435	28706	29047	31610	32768	28441	27642	27421	30940	28410
Total phosphorus	35135	33895	35135	35135	35135	35135	33901	35135	35135	35135	33798	35135	35135	35135	35135
Dissolved organic matter	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135
Ortho-phosphorus	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135

Table 3: Total number of missing values (out of 35135)

1.3.2 Total number of missing values as a percentage

Variable	Catchment Number														
	Green					Blue					Red				
	4	5	6	12	13	9	8	7	11	14	2	3	1	10	15
Flow	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
PLC Switch	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Nitrate+nitrite	78	78	82	96	92	78	83	83	90	95	82	77	79	88	81
Ammonia	75	83	80	96	93	78	82	83	90	93	81	79	78	88	83
Ammonium	75	83	76	96	93	78	82	83	90	93	81	79	78	88	81
Conductivity	76	83	76	96	93	78	82	83	90	93	81	79	78	88	81
Dissolved oxygen	75	83	80	96	93	78	82	83	90	93	81	79	78	88	83
pH	75	83	76	96	93	78	82	83	90	93	81	79	78	88	81
Flow cell water temperature	75	83	76	96	93	78	82	83	90	93	81	79	78	88	81
Turbidity	75	83	77	96	93	78	82	83	90	93	81	79	78	88	81
Total phosphorus	100	96	100	100	100	100	96	100	100	100	96	100	100	100	100
Dissolved organic matter	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ortho-phosphorus	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 4: Total number of missing values as a percentage

1.3.3 Total number of missing values when PLC switch = 1

Variable	Catchment Number														
	Green					Blue					Red				
	4	5	6	12	13	9	8	7	11	14	2	3	1	10	15
Flow	8	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Nitrate+nitrite	862	167	1883	48	63	596	562	138	41	1186	408	223	1409	60	197
Ammonia	94	1979	1447	1	605	475	16	3	17	635	73	956	1117	0	732
Ammonium	95	1979	38	1	605	475	16	3	17	635	73	956	1117	0	5
Conductivity	288	1979	38	2	605	475	16	3	18	635	201	956	1117	0	5
Dissolved oxygen	94	1979	1447	1	610	475	16	3	17	635	73	956	1117	0	732
pH	94	1979	38	1	605	475	16	3	17	635	73	956	1117	0	5
Flow cell water temperature	94	1979	38	1	605	475	16	3	17	635	73	956	1117	0	5
Turbidity	94	1979	193	1	605	475	16	3	17	635	75	956	1117	0	5
Dissolved organic matter	8739	7834	8376	1574	2995	8175	6445	6091	3542	3002	6769	8449	8831	4195	6730
Ortho-phosphorus	8739	7834	8376	1574	2995	8175	6445	6091	3542	3002	6769	8449	8831	4195	6730

Table 5: Total number of missing values when PLC switch = 1 (flow >0.2 l/s)

1.3.4 Total number of measured values in flume data as a percentage of possible values when PLC switch = 1

Variable	Catchment Number														
	Green					Blue					Red				
	4	5	6	12	13	9	8	7	11	14	2	3	1	10	15
Flow	101	113	105	561	294	108	137	145	249	294	130	105	100	210	131
Nitrate+nitrite	90	98	78	97	98	93	91	98	99	60	94	97	84	99	97
Ammonia	99	75	83	100	80	94	100	100	100	79	99	89	87	100	89
Ammonium	99	75	100	100	80	94	100	100	100	79	99	89	87	100	100
Conductivity	97	75	100	100	80	94	100	100	99	79	97	89	87	100	100
Dissolved oxygen	99	75	83	100	80	94	100	100	100	79	99	89	87	100	89
pH	99	75	100	100	80	94	100	100	100	79	99	89	87	100	100
Flow cell water temperature	99	75	100	100	80	94	100	100	100	79	99	89	87	100	100
Turbidity	99	75	98	100	80	94	100	100	100	79	99	89	87	100	100
Dissolved organic matter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ortho-phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 6: Total number of measured values in flume data as a percentage of possible values when PLC switch = 1 (flow >0.2 l/s)

1.3.5 Timesteps of missing 15 minute data when PLC switch = 1 (flow >0.2 l/s)

- Data are in farmlet/catchment/triplet order with catchments arranged from largest to smallest down the page.
- Colour bars represent missing 15 minute timestep water quality data for each farmlet when flow >0.2 l/s and may reflect data loss due to sensor downtime or where data failed the quality control process.
- NB. Total phosphorus, ortho-phosphorus and flume temperature not included as sampling and measurement are not influenced by the PLC switch values.

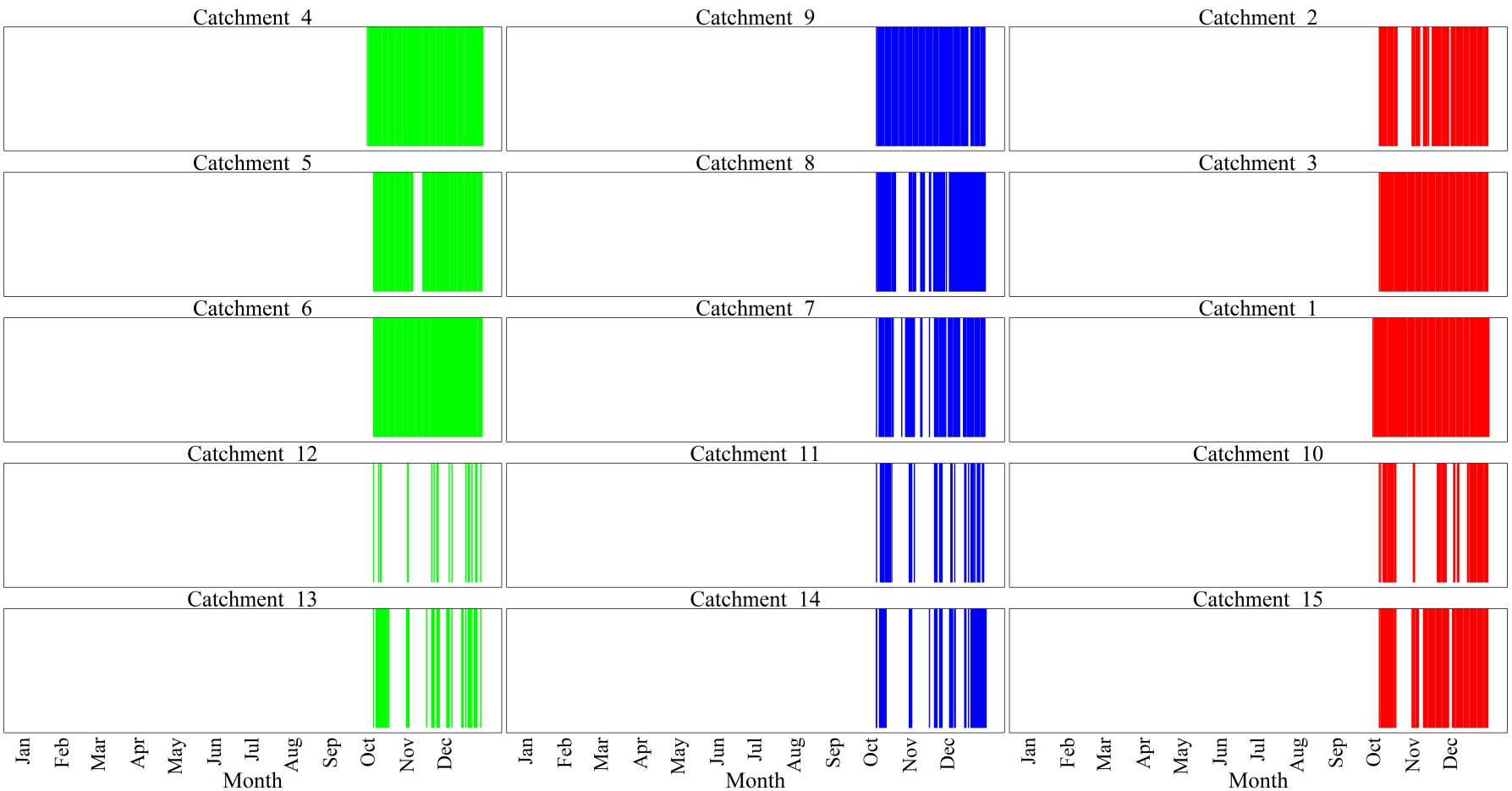


Figure 1: Timesteps of missing nitrate+nitrite data

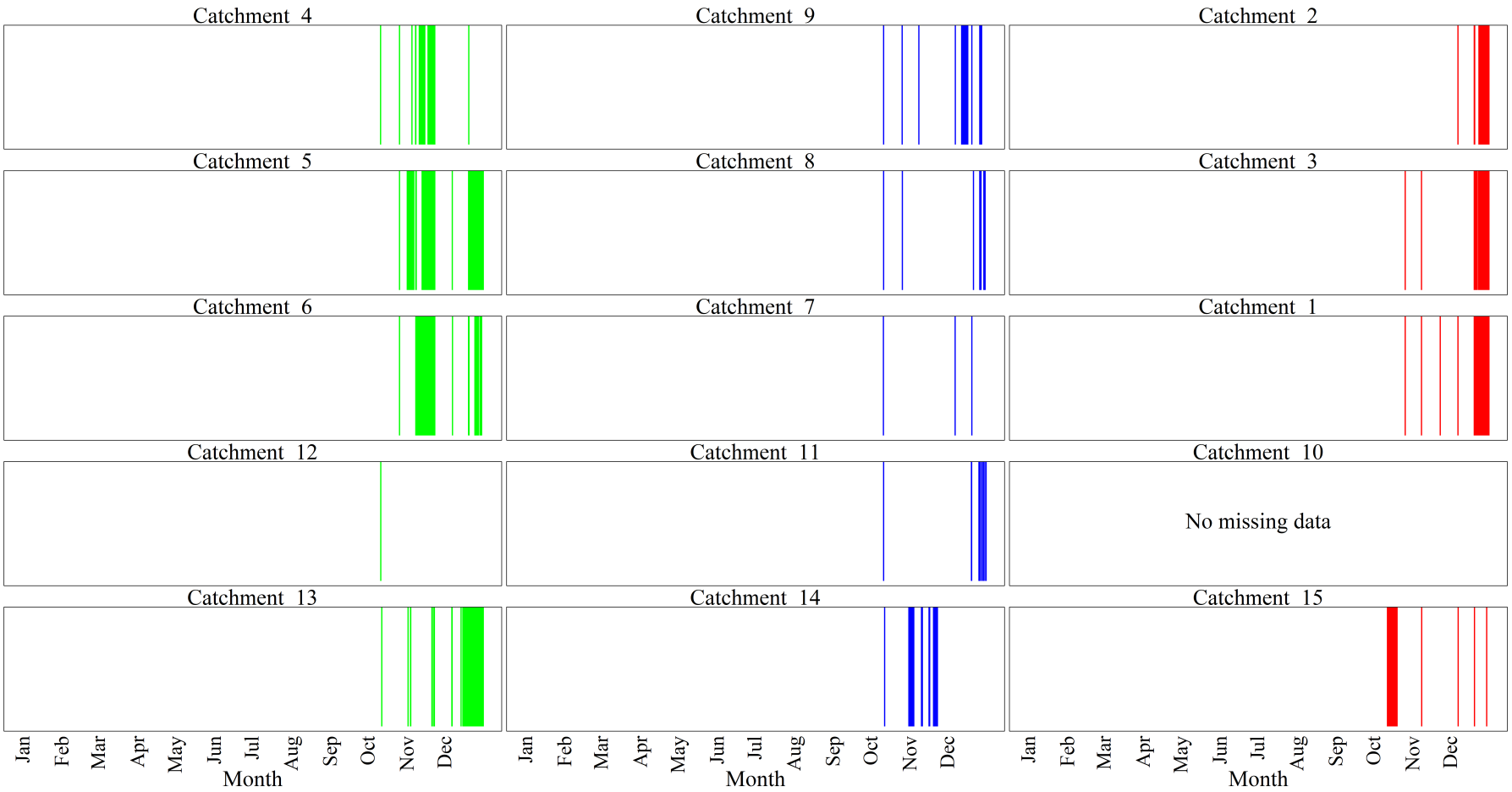


Figure 2: Timesteps of missing ammonia data

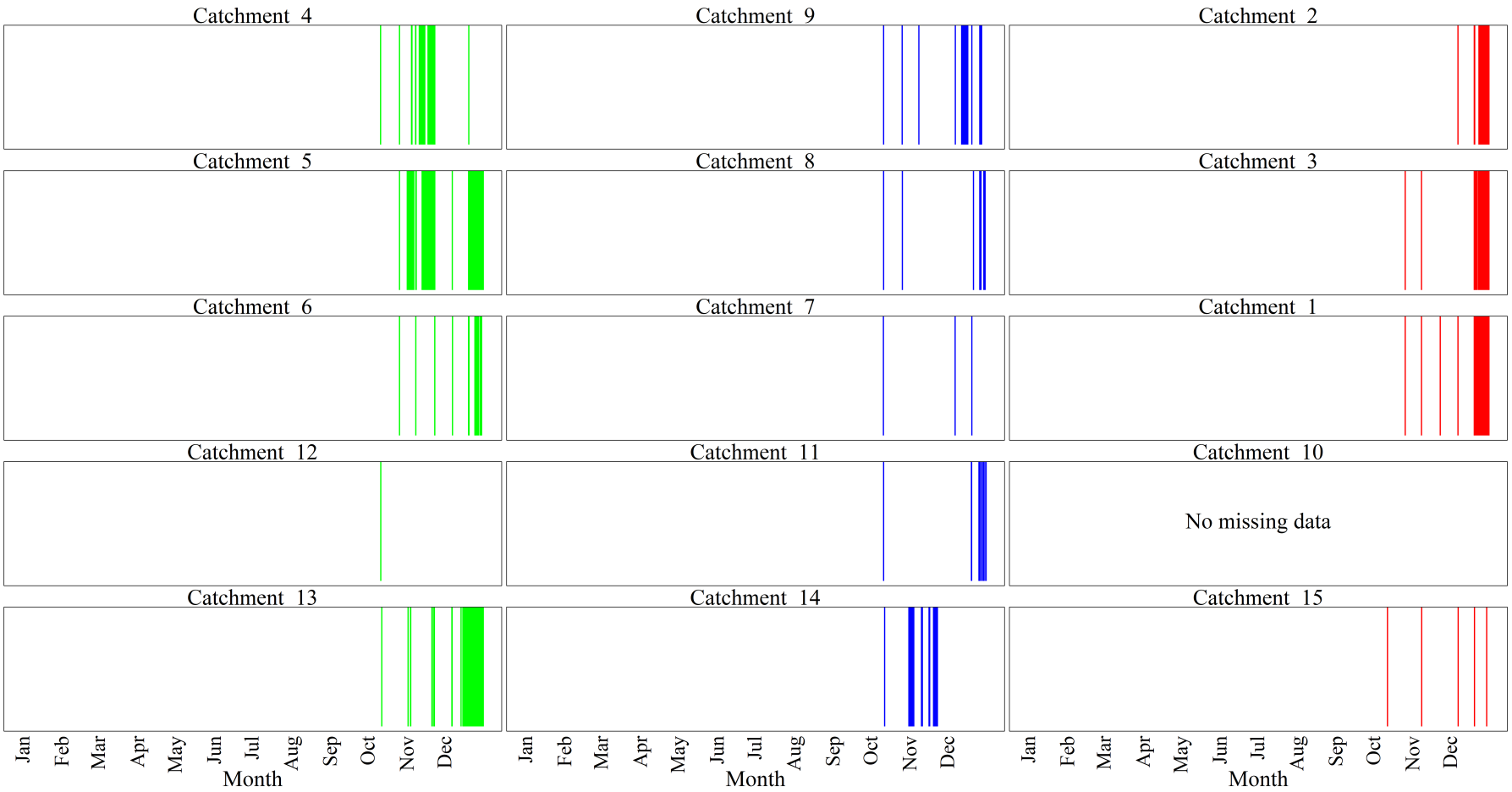


Figure 3: Timesteps of missing ammonium data

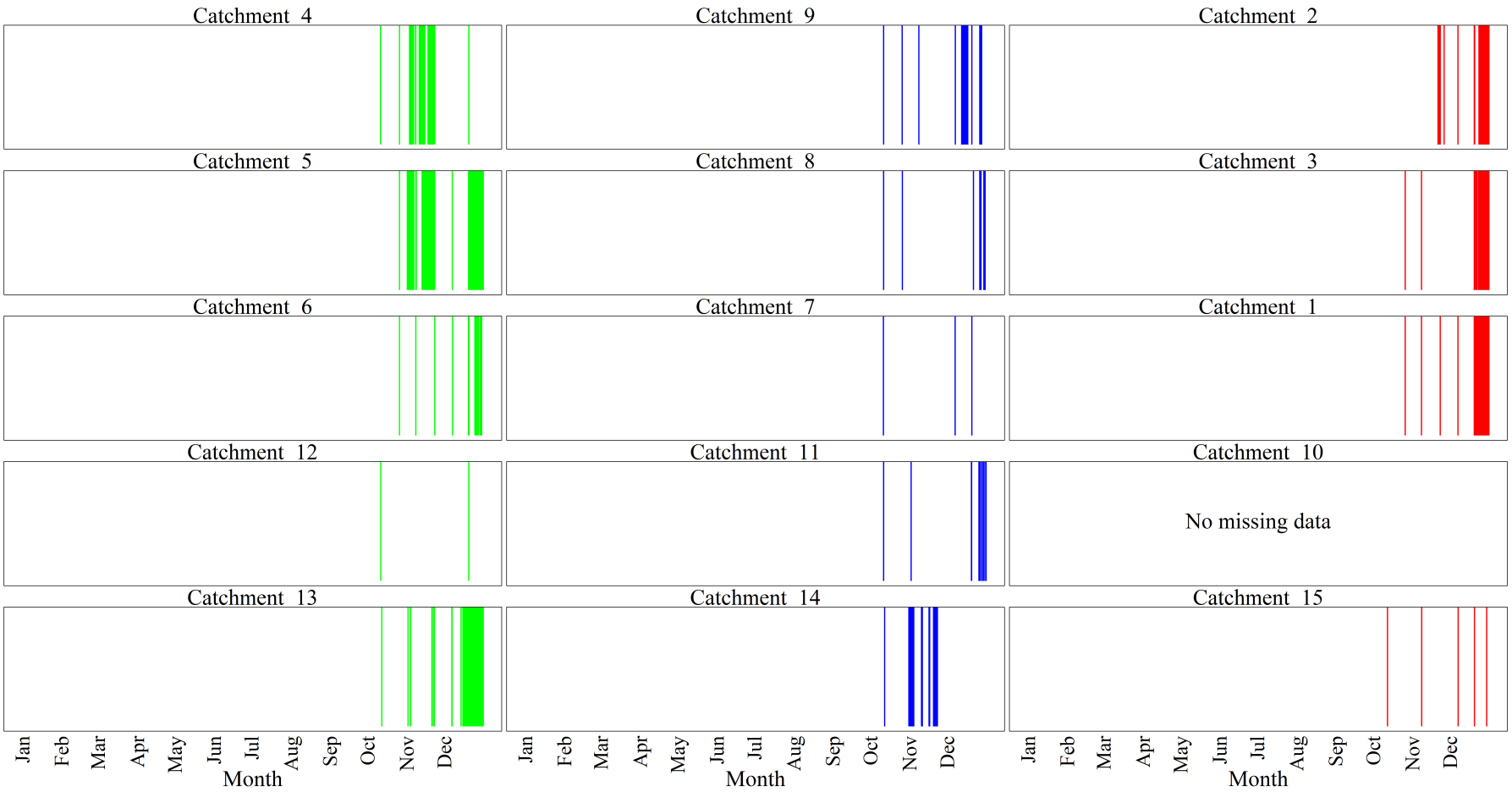


Figure 4: Timesteps of missing conductivity data

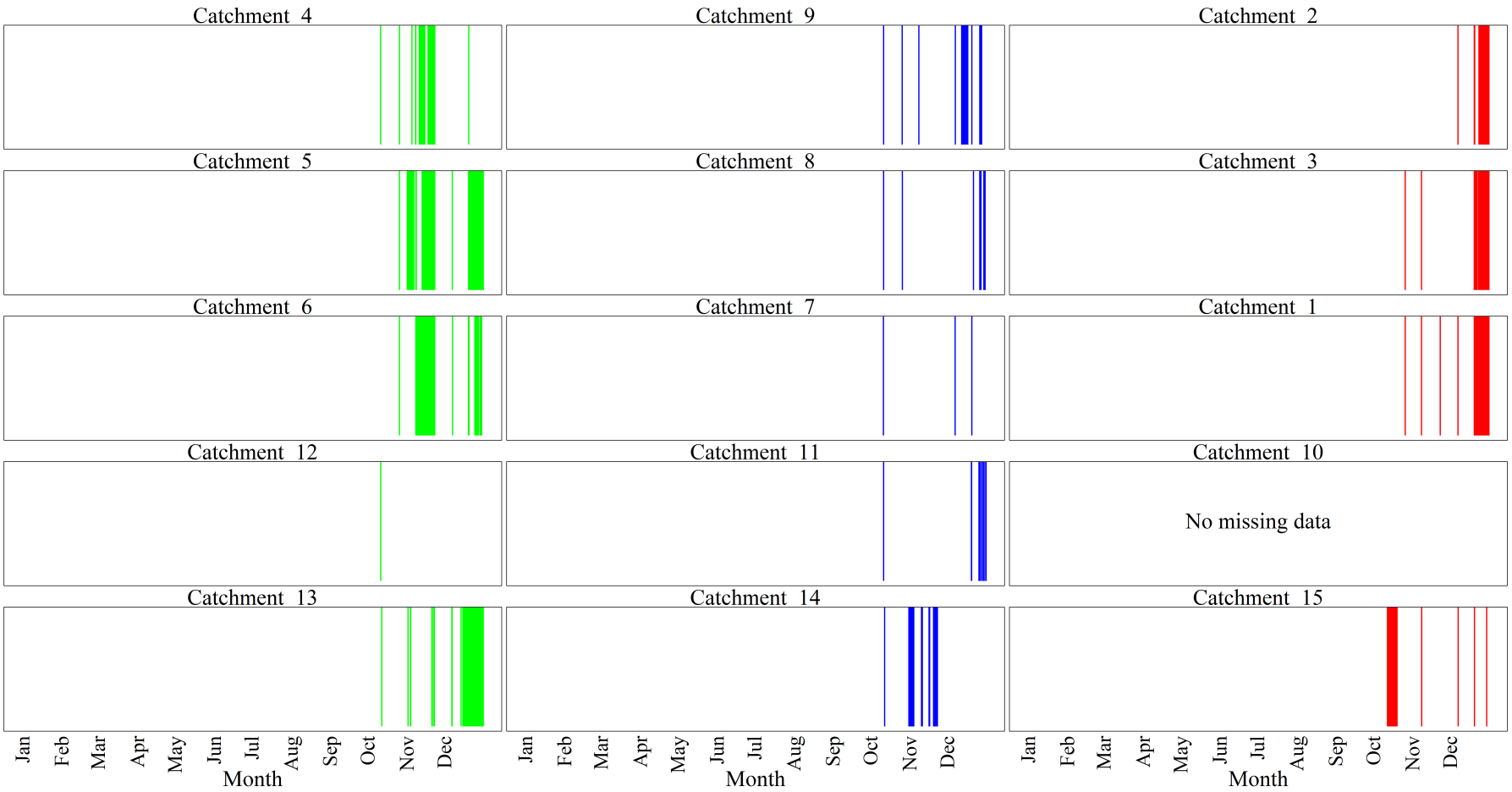


Figure 5: Timesteps of missing dissolved oxygen data

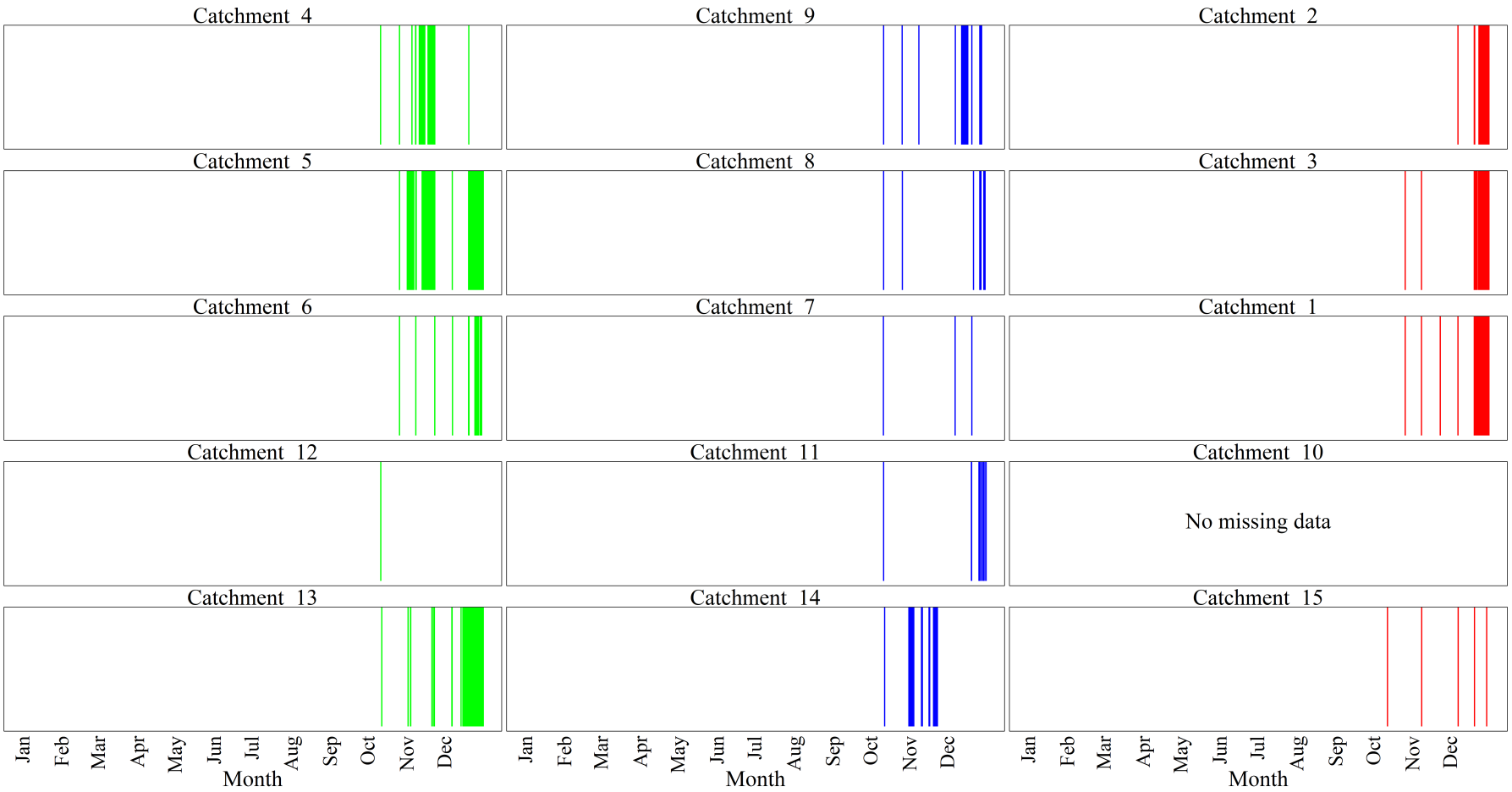


Figure 6: Timesteps of missing pH data

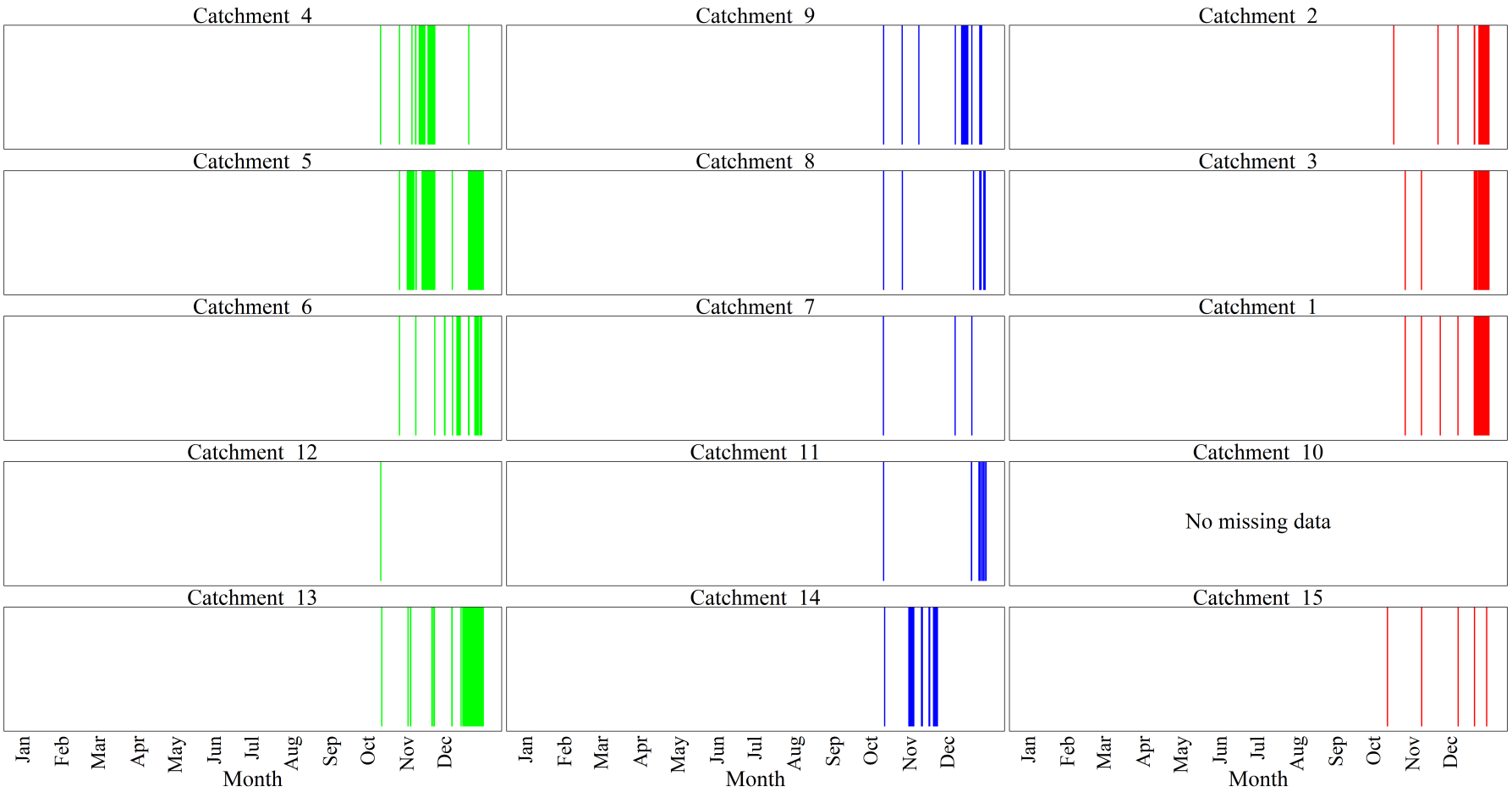


Figure 7: Timesteps of missing flow cell water temperature data

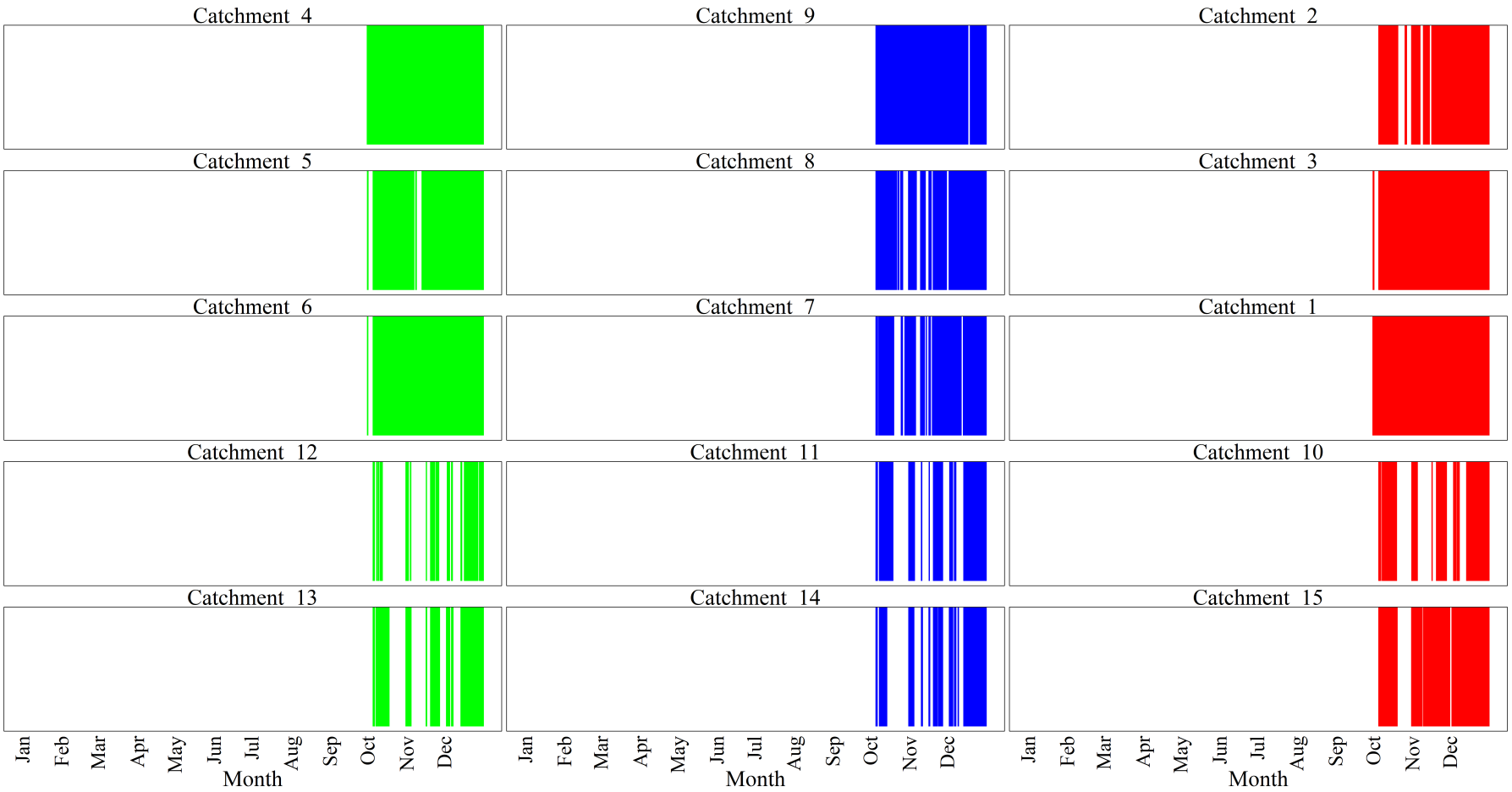


Figure 8: Timesteps of missing turbidity data

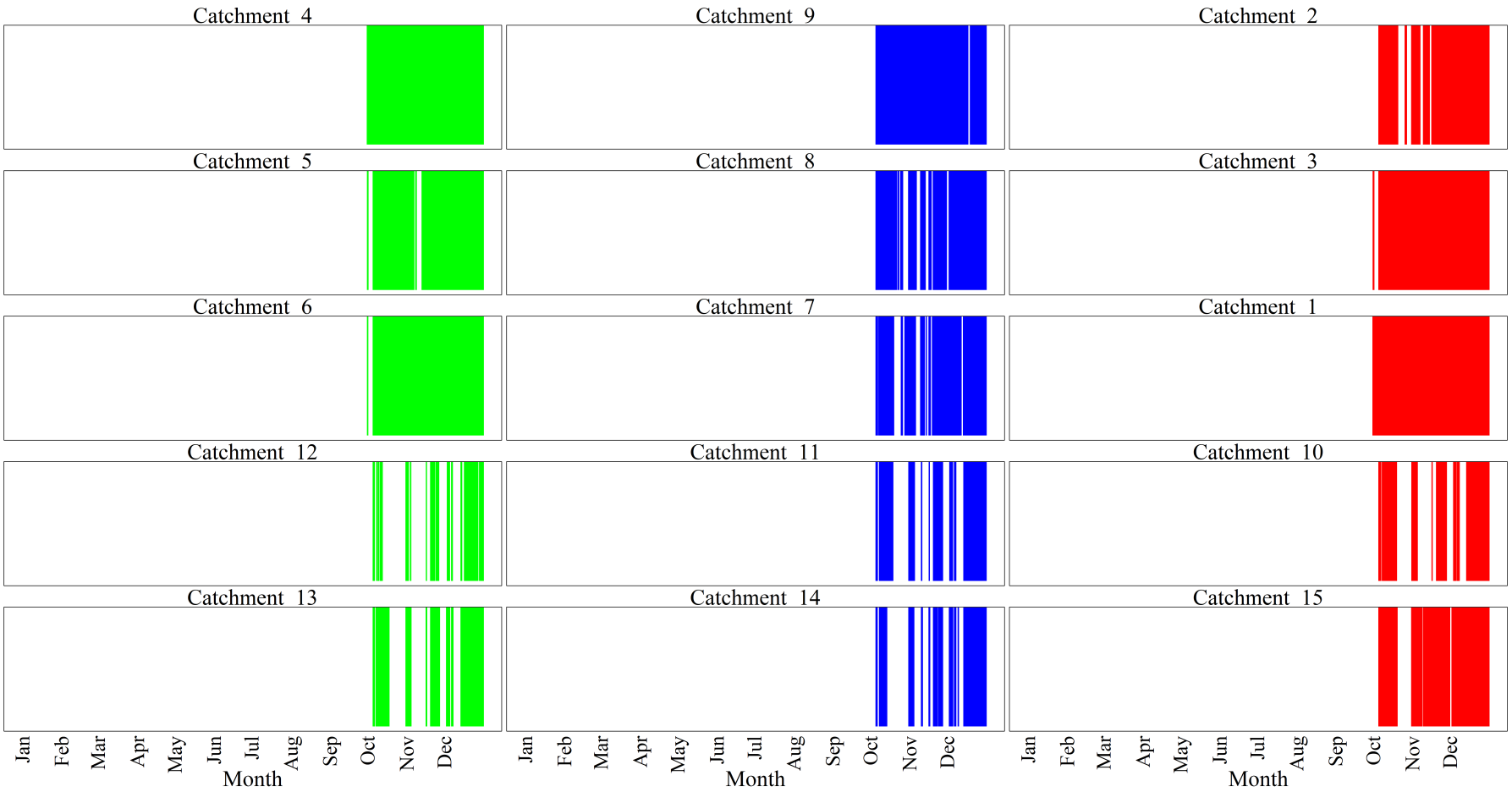


Figure 9: Timesteps of missing dissolved organic matter data

1.4 Histograms of 15 minute data distribution

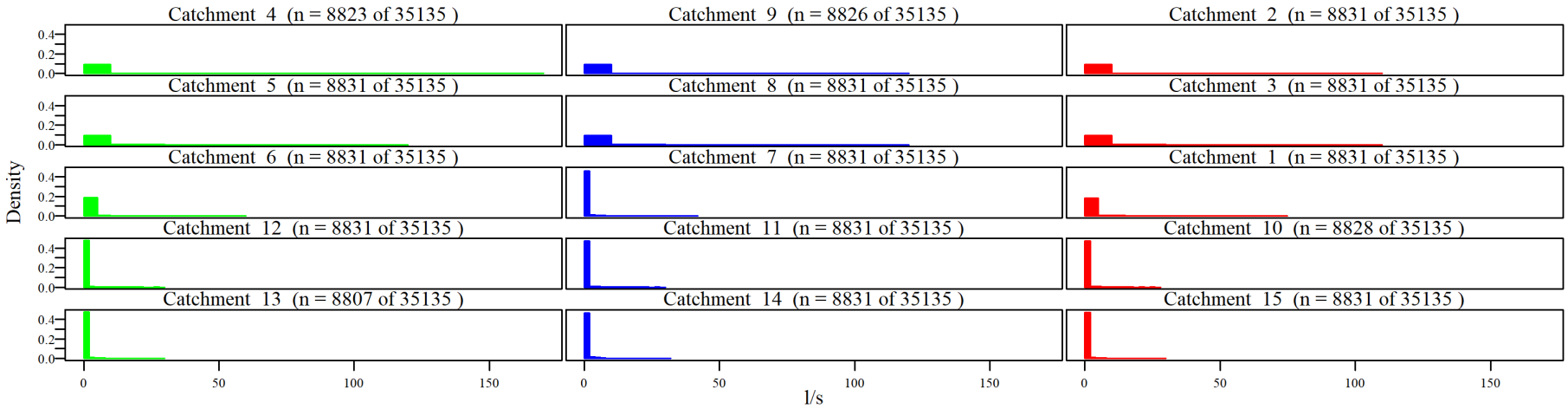


Figure 10: Distribution of data - flow

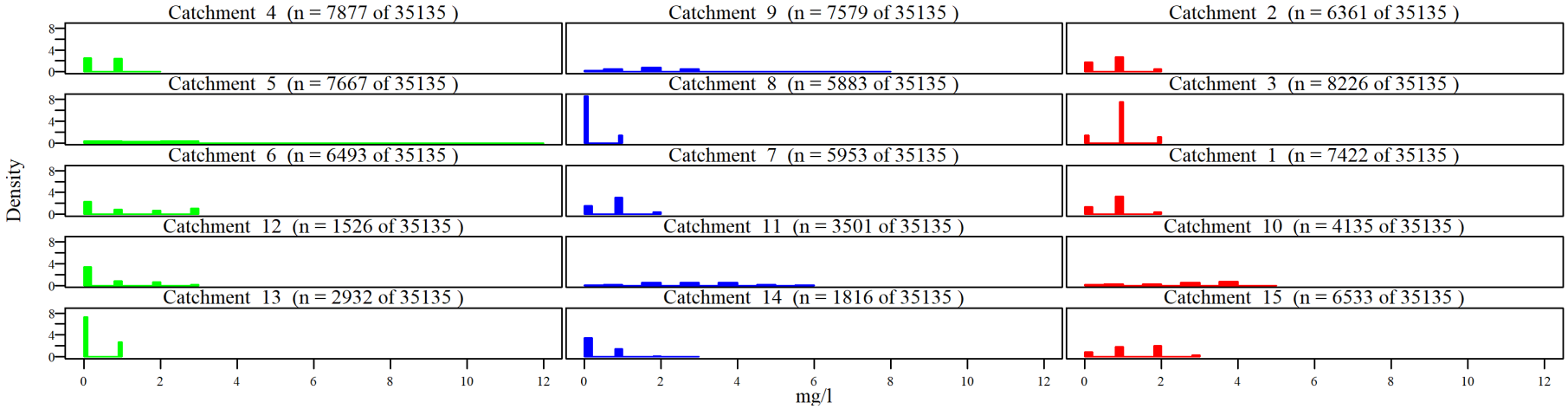


Figure 11: Distribution of data - nitrate+nitrite

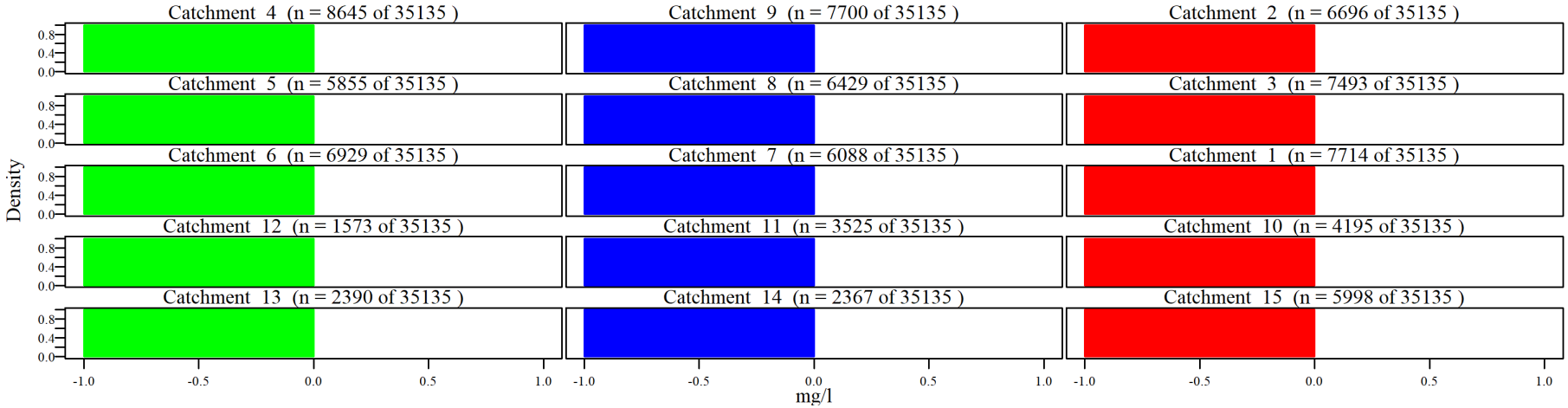


Figure 12: Distribution of data - ammonia

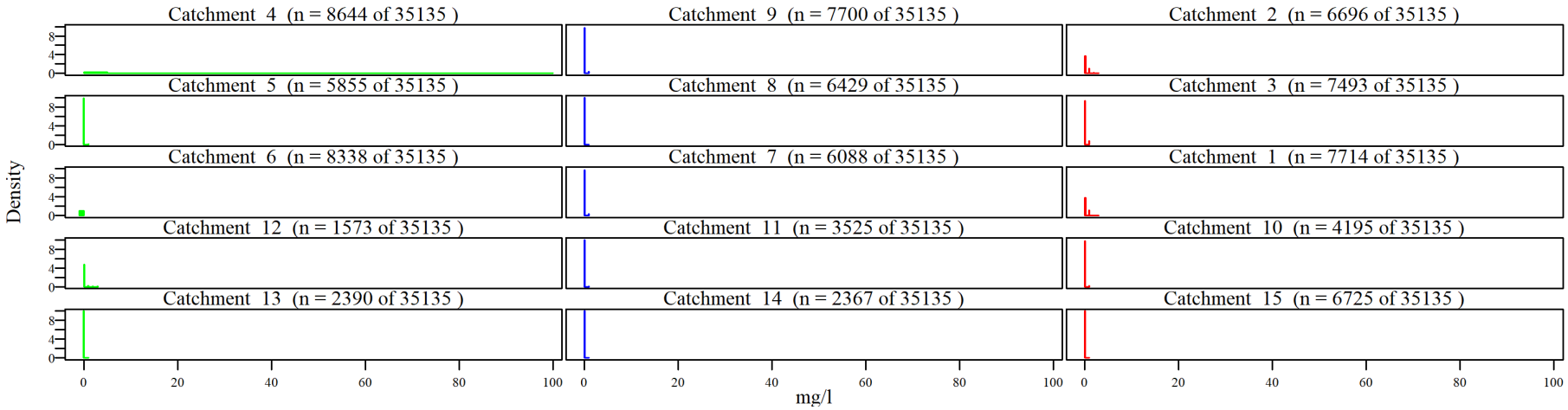


Figure 13: Distribution of data - ammonium

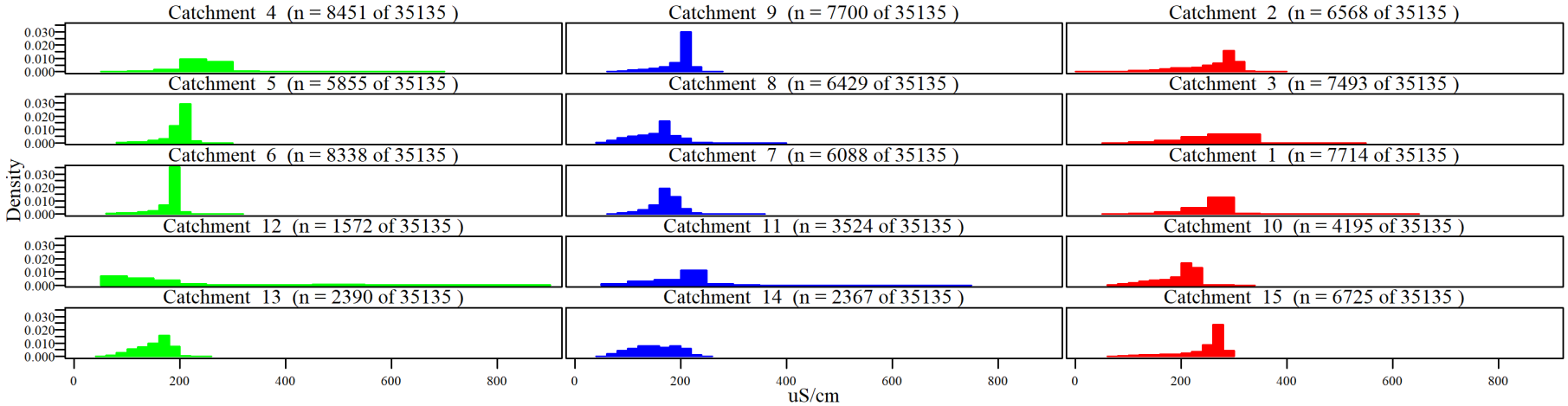


Figure 14: Distribution of data - conductivity

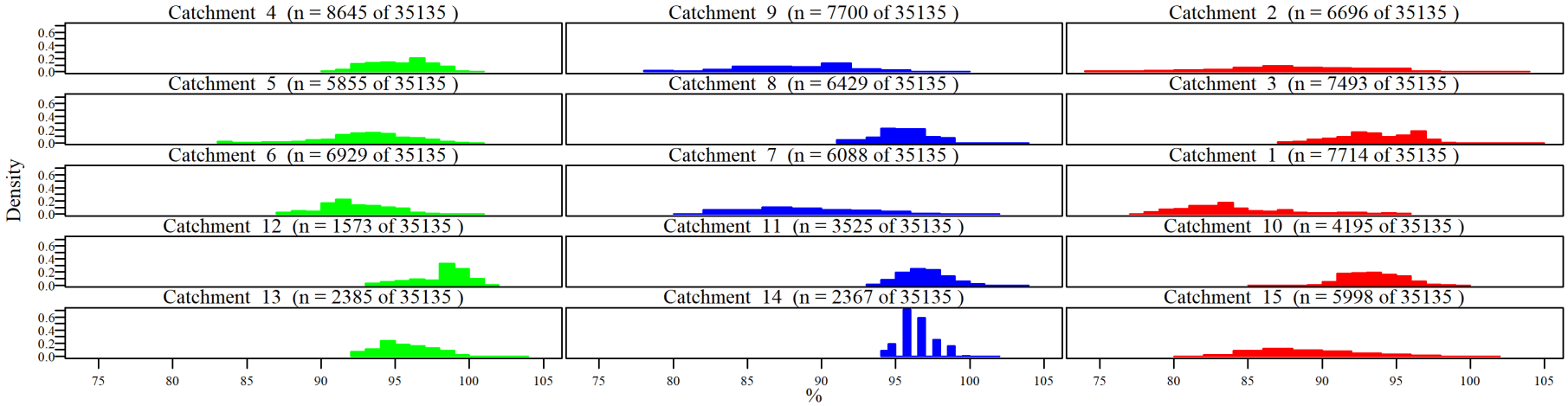


Figure 15: Distribution of data - dissolved oxygen

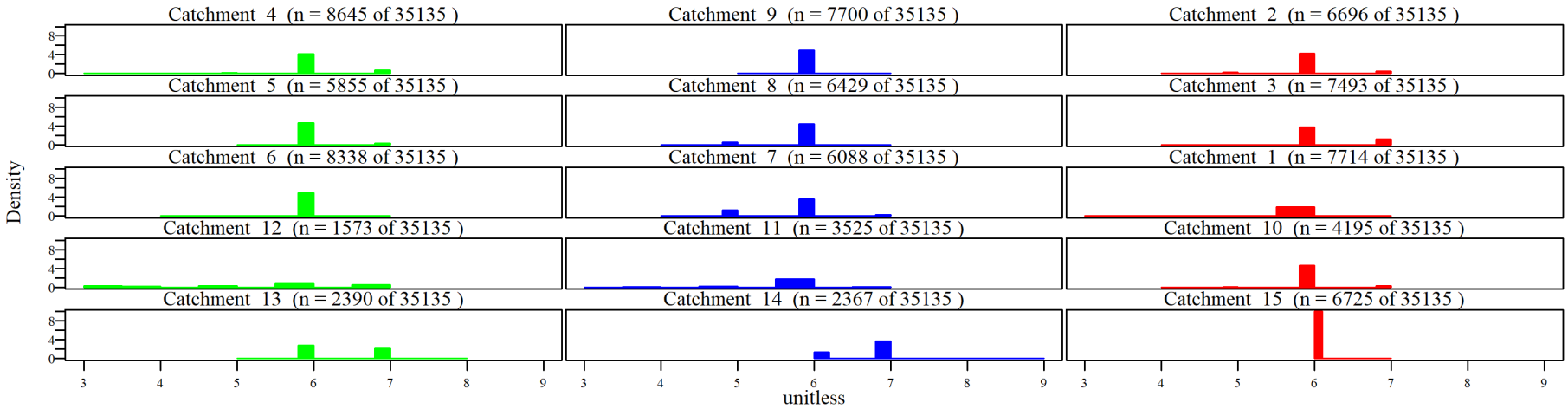


Figure 16: Distribution of data - pH

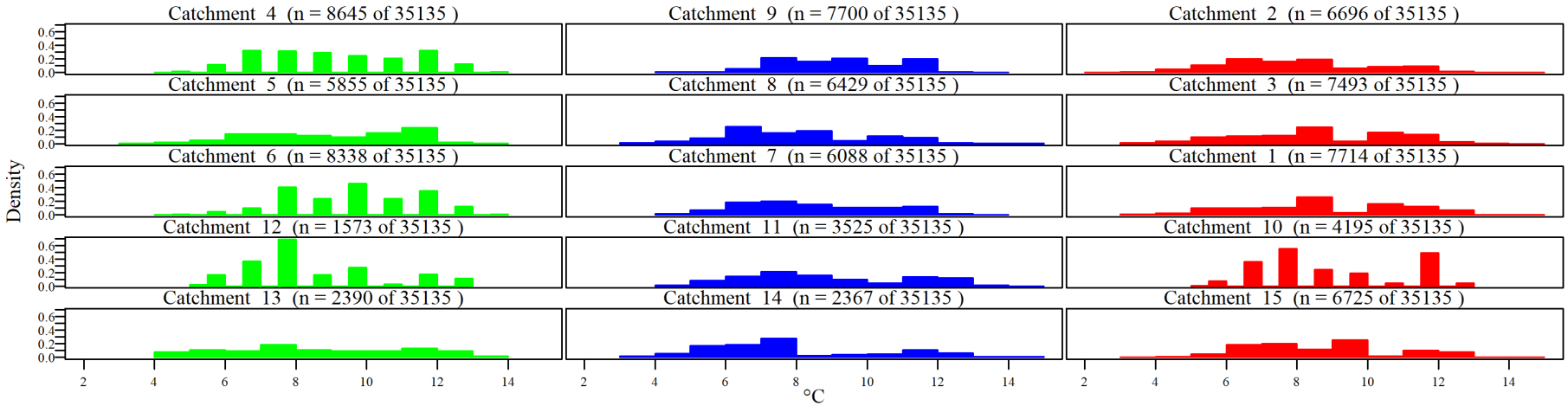


Figure 17: Distribution of data - flow cell water temperature

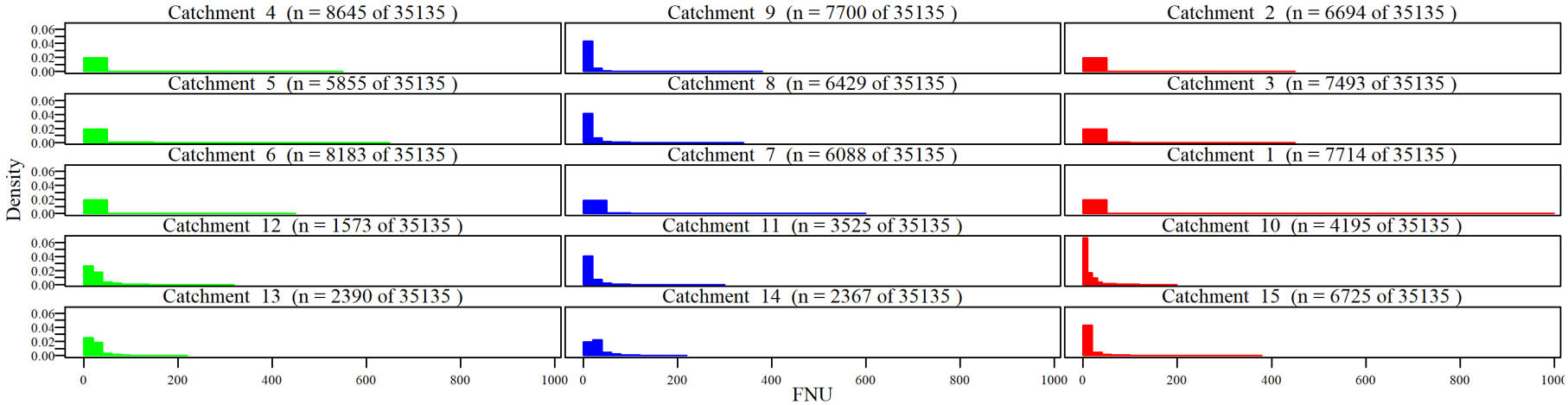


Figure 18: Distribution of data - turbidity

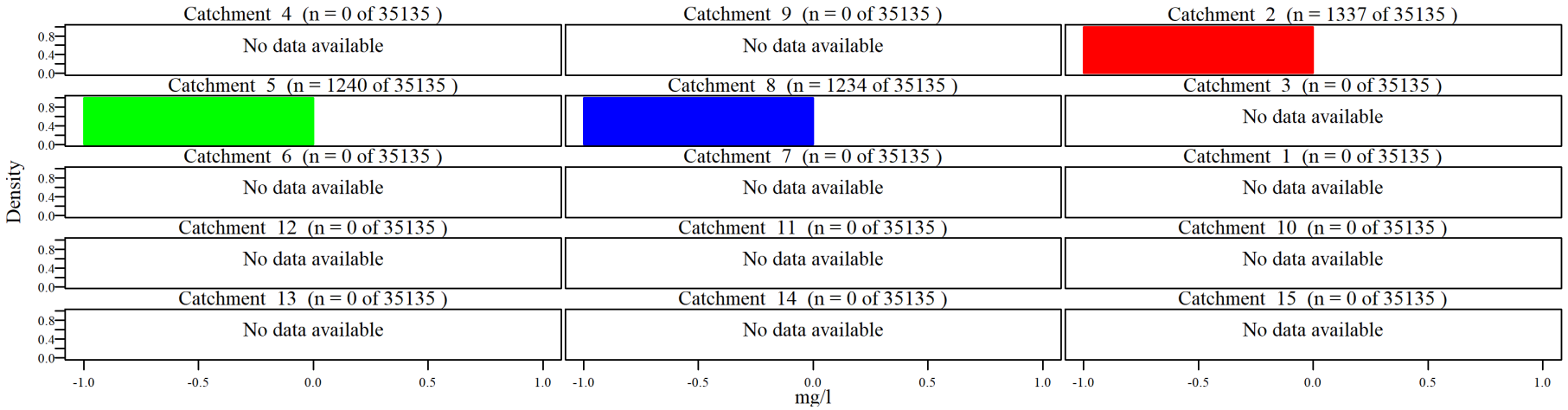


Figure 19: Distribution of data - total phosphorus

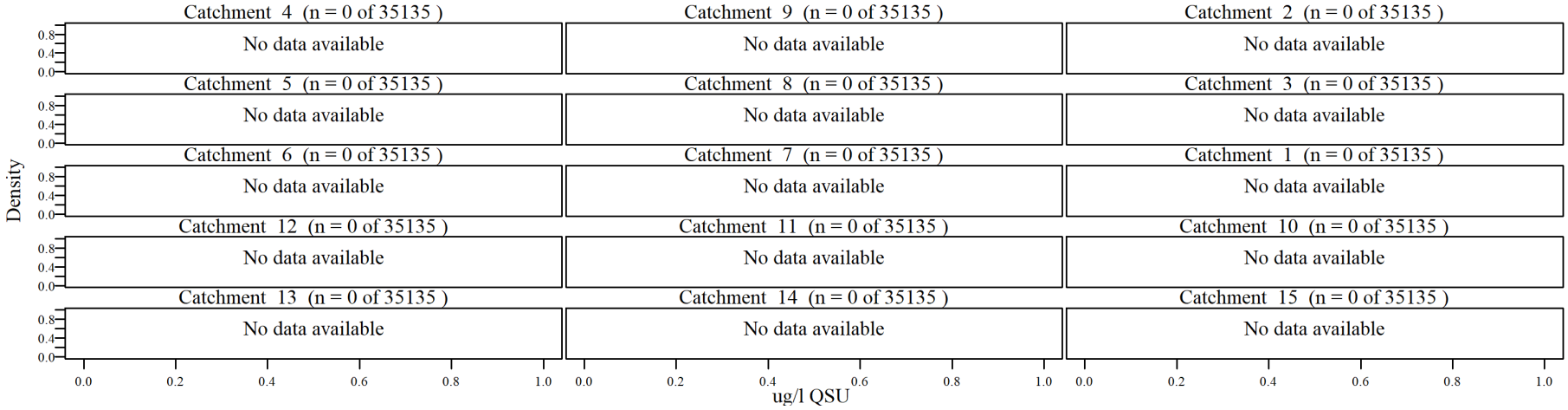


Figure 20: Distribution of data - dissolved organic matter

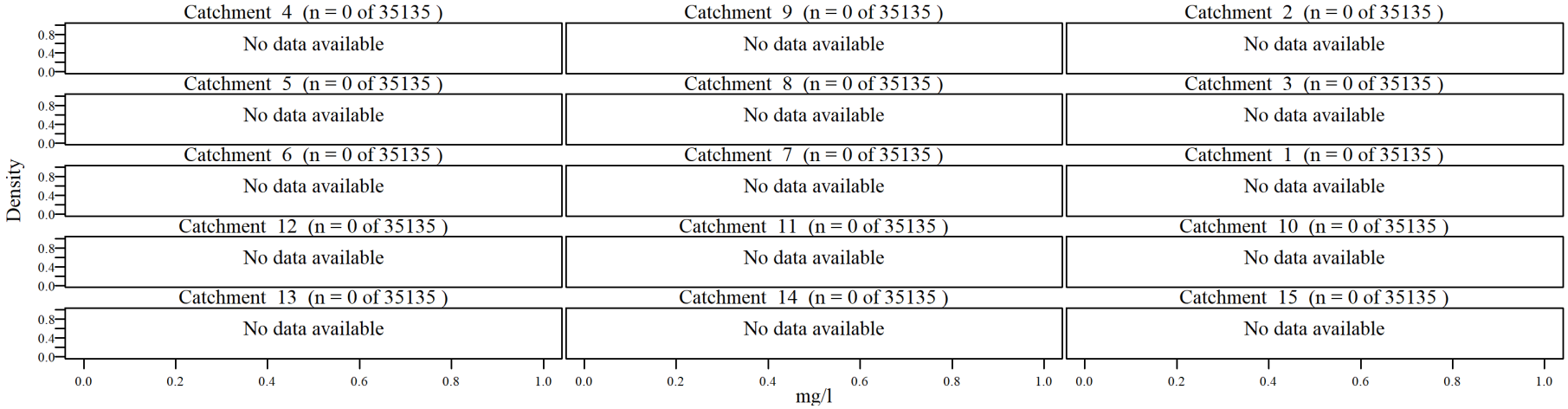


Figure 21: Distribution of data - ortho-phosphorus

1.5 Time series

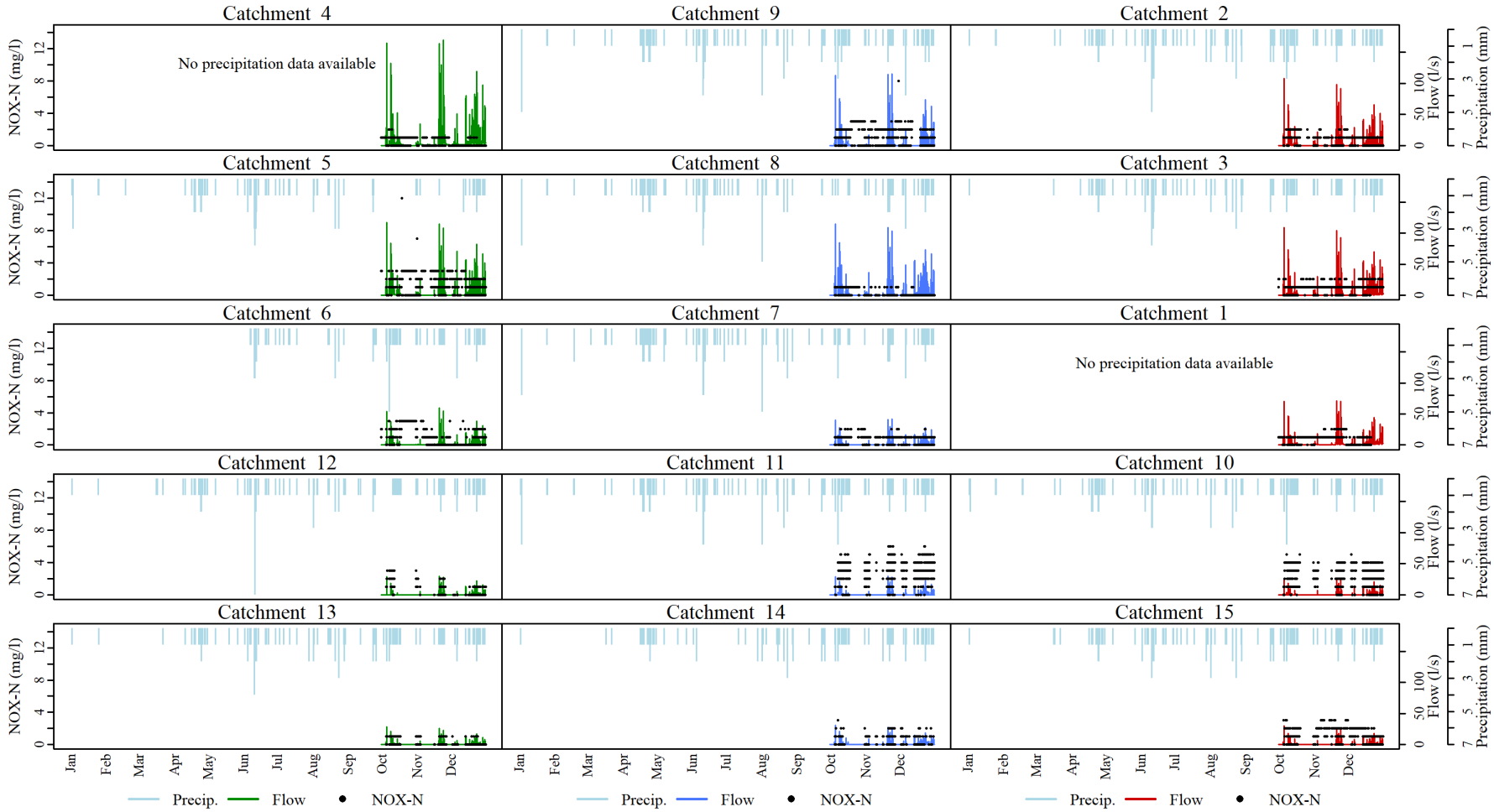


Figure 22: Time series of precipitation, flow and nitrate+nitrite (NOX-N)

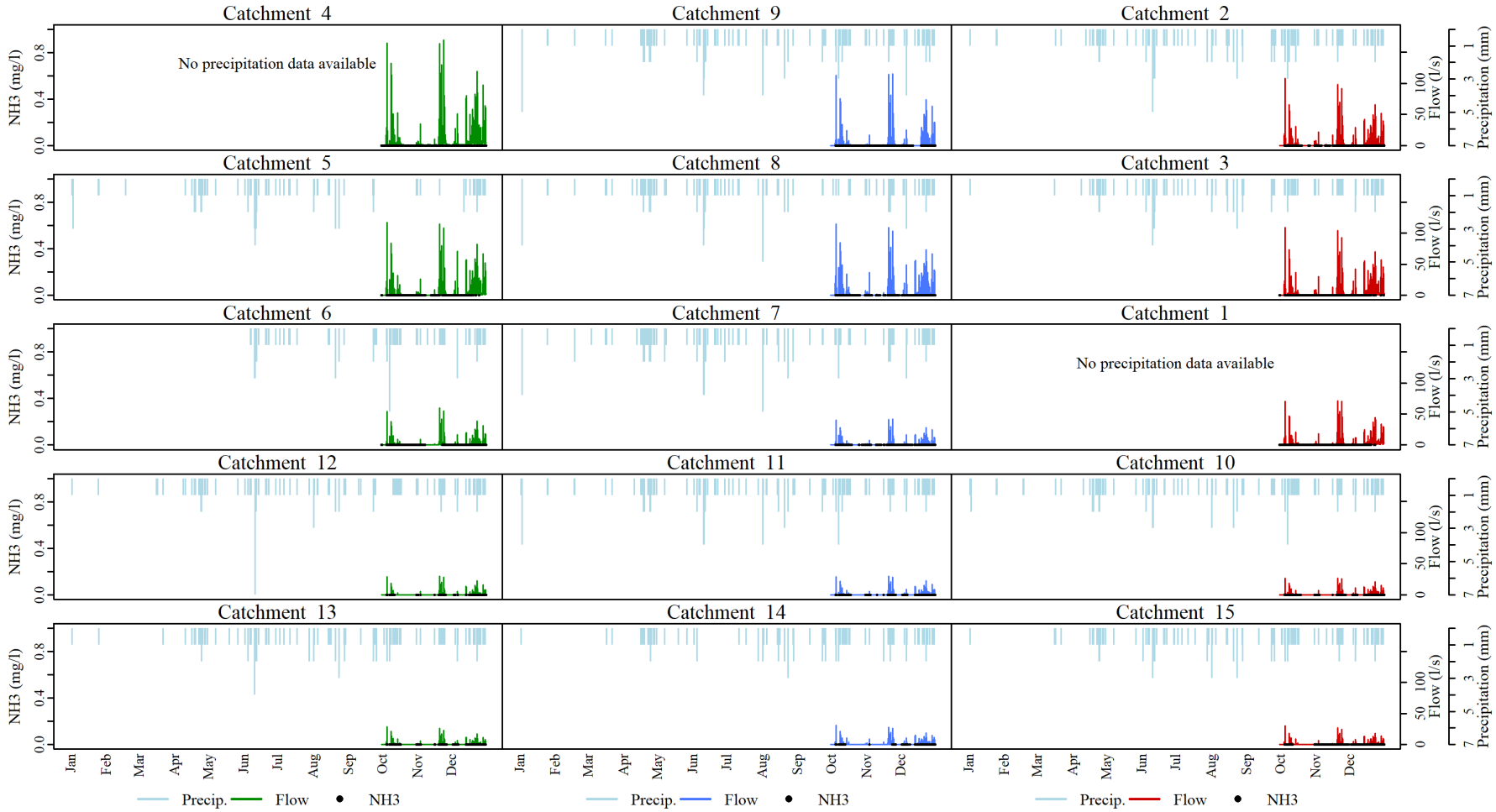


Figure 23: Time series of precipitation, flow and ammonia (NH3)

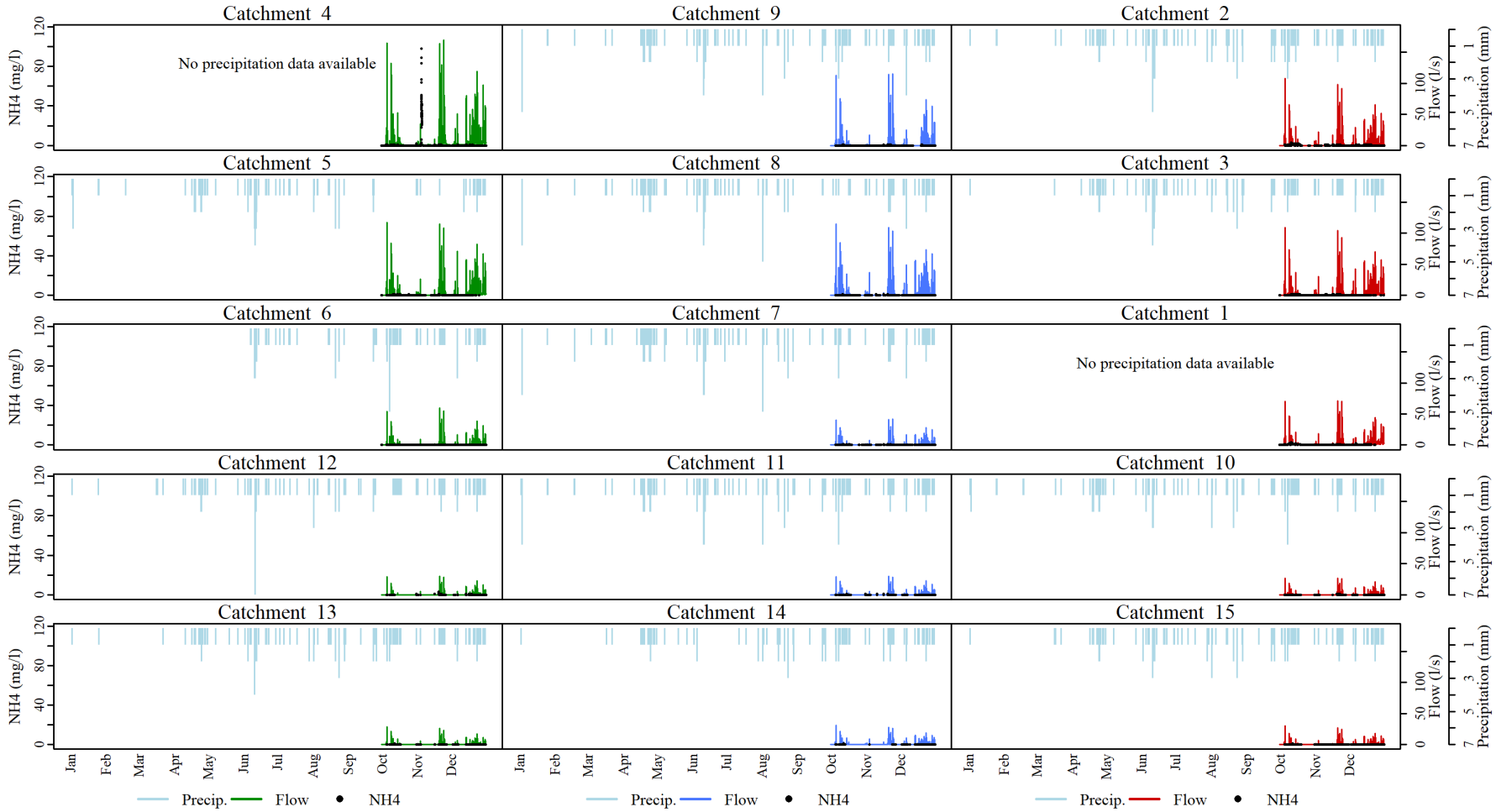


Figure 24: Time series of precipitation, flow and ammonium (NH4)

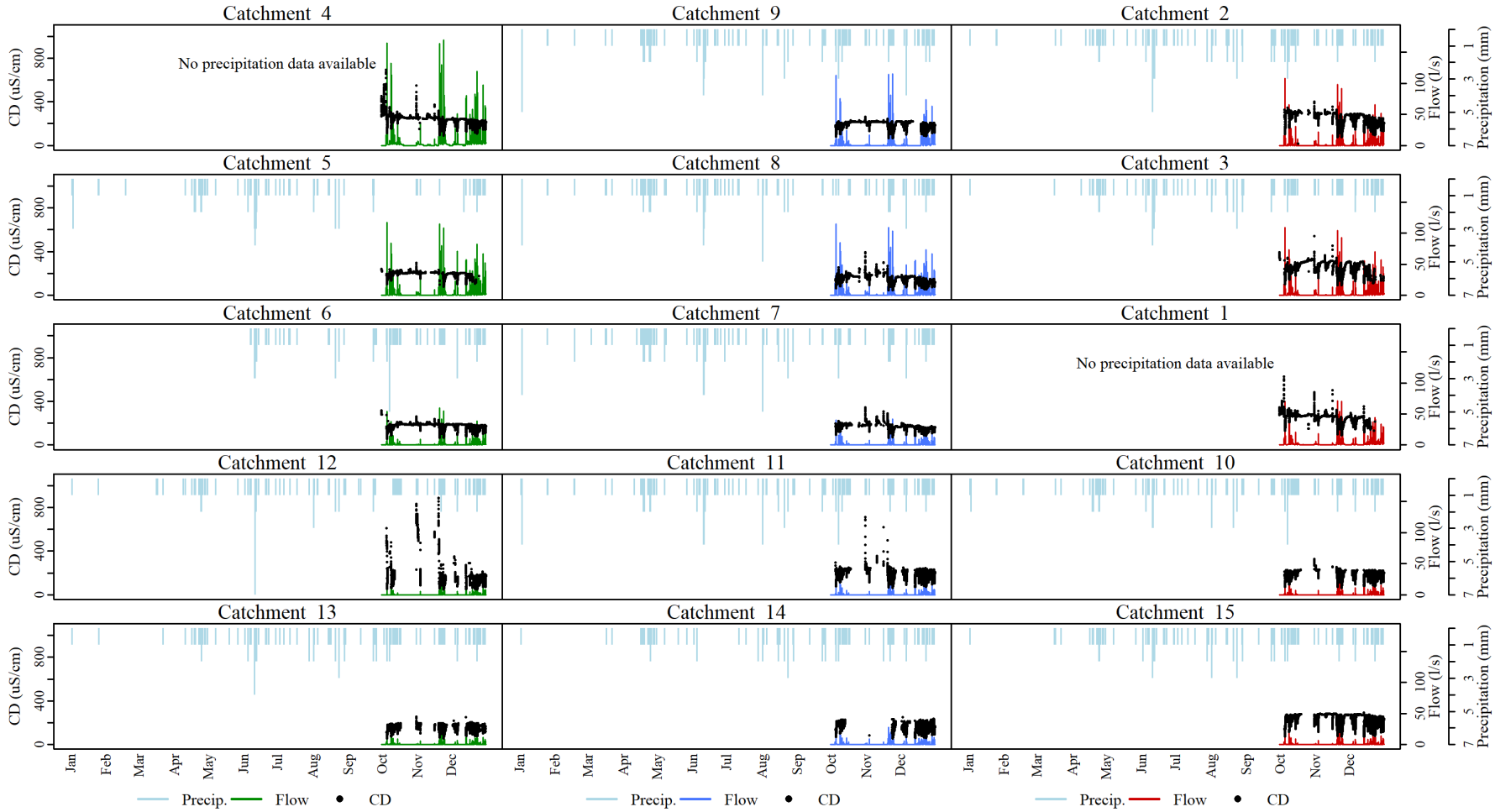


Figure 25: Time series of precipitation, flow and conductivity (CD)

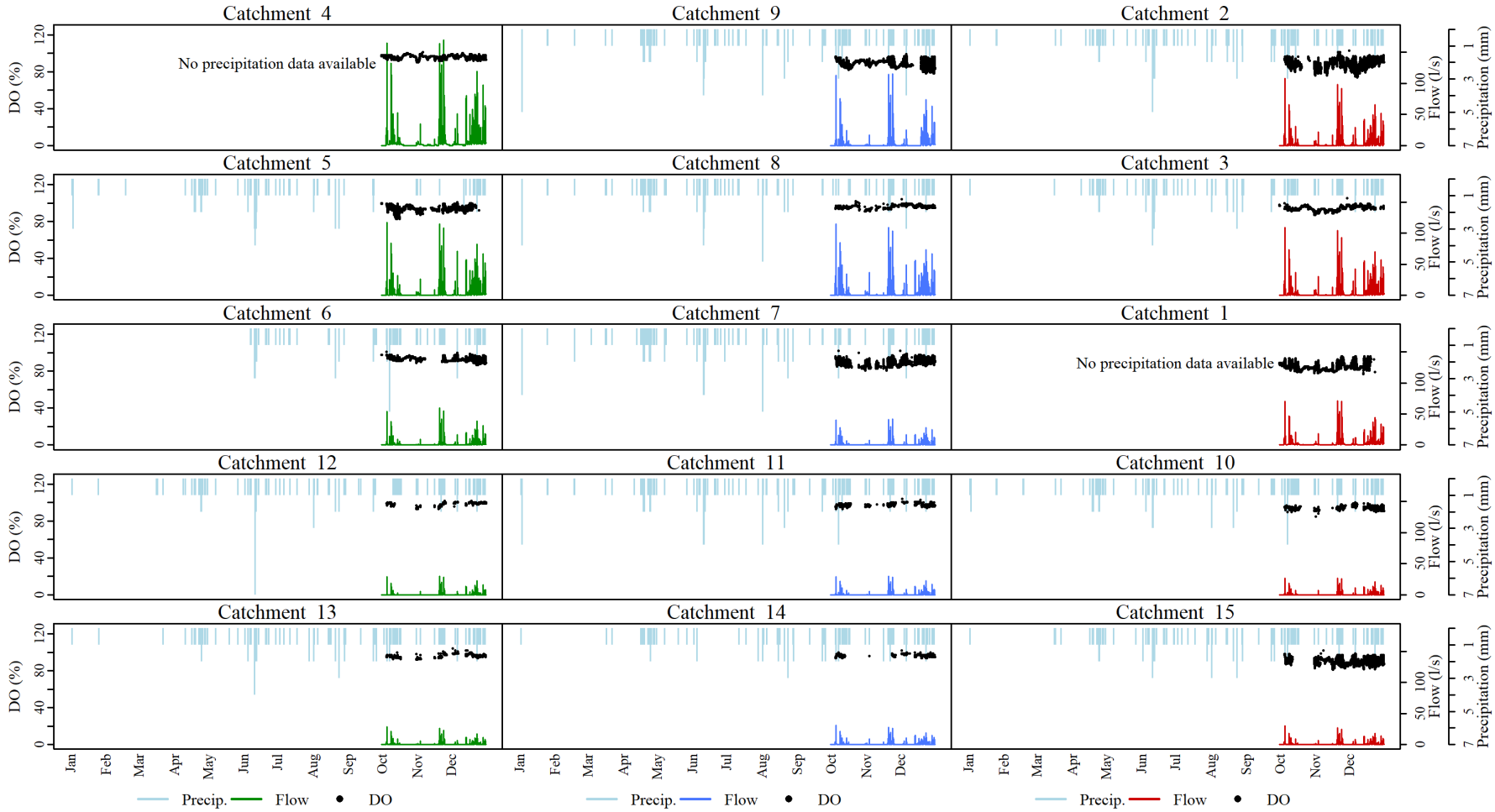


Figure 26: Time series of precipitation, flow and dissolved oxygen (DO)

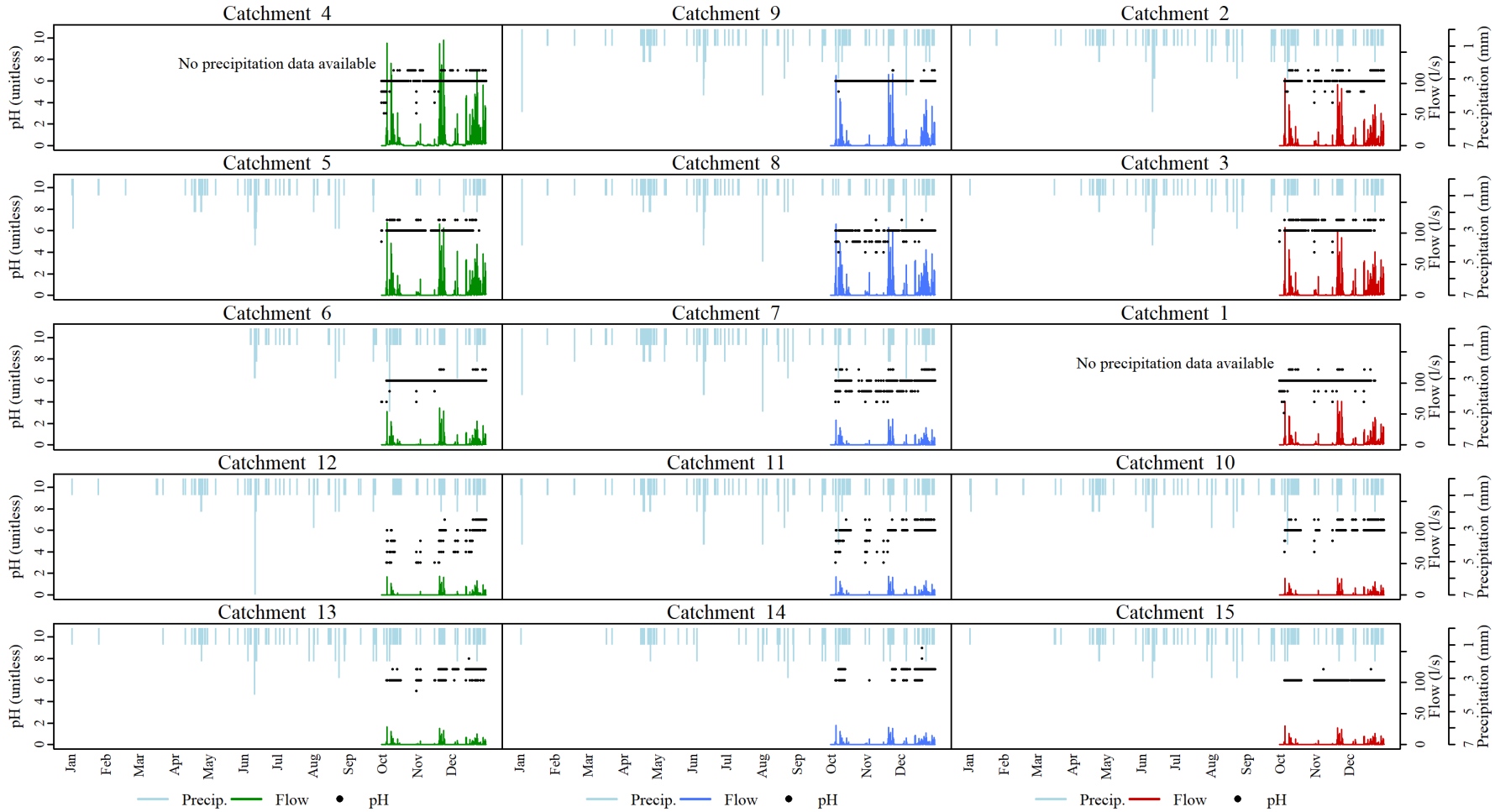


Figure 27: Time series of precipitation, flow and pH (pH)

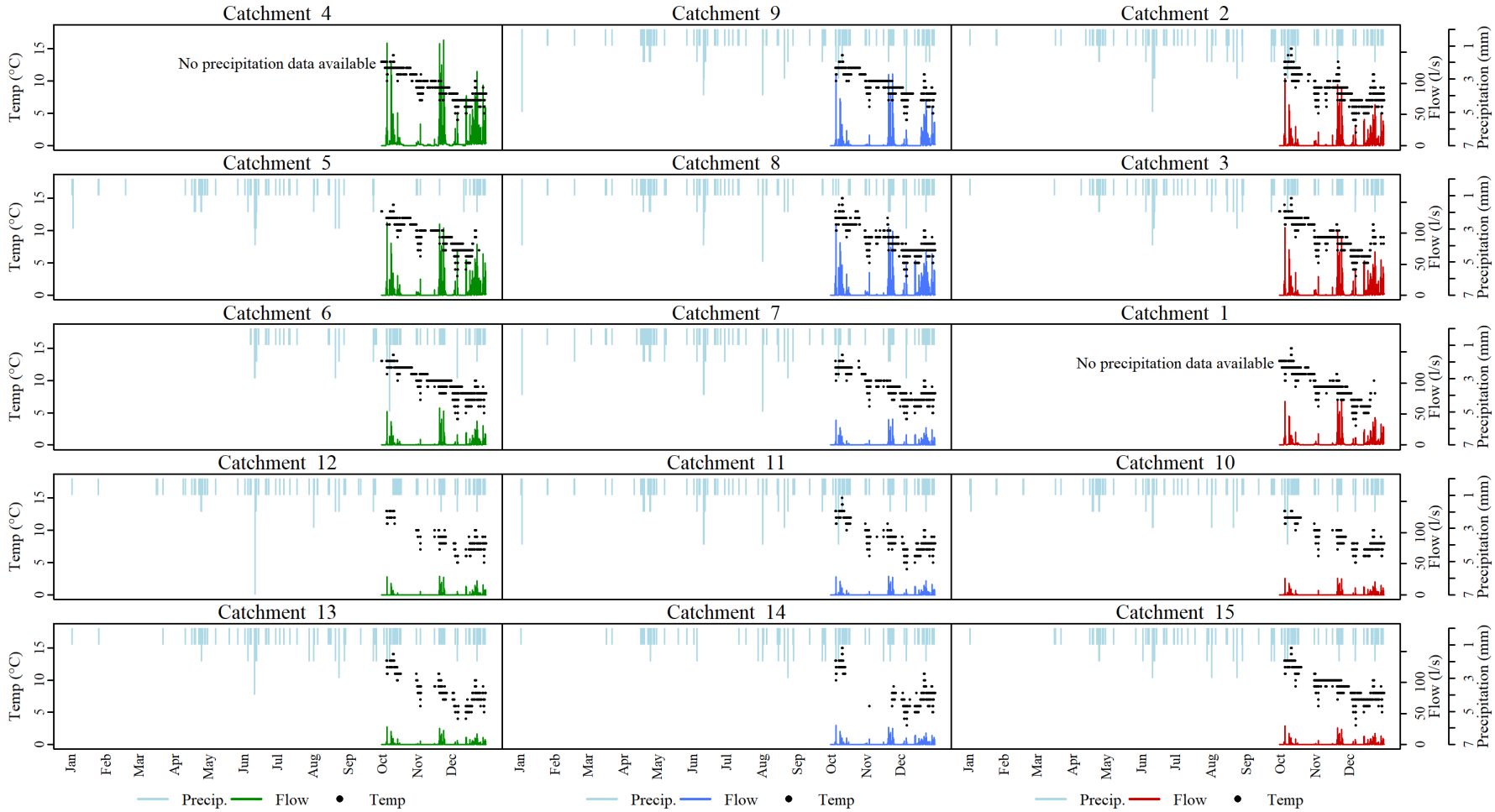


Figure 28: Time series of precipitation, flow and flow cell water temperature (Temp)

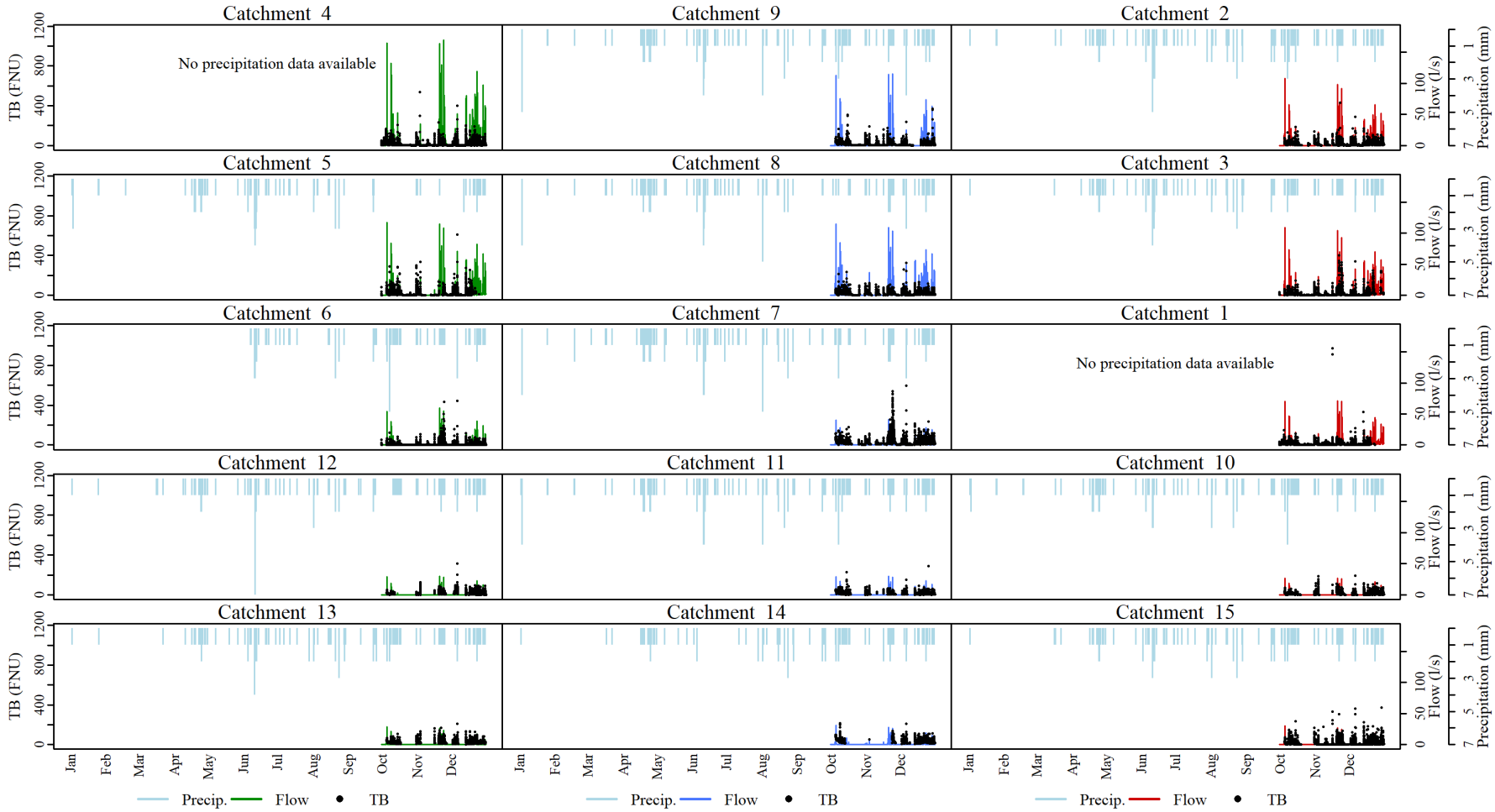


Figure 29: Time series of precipitation, flow and turbidity (TB)

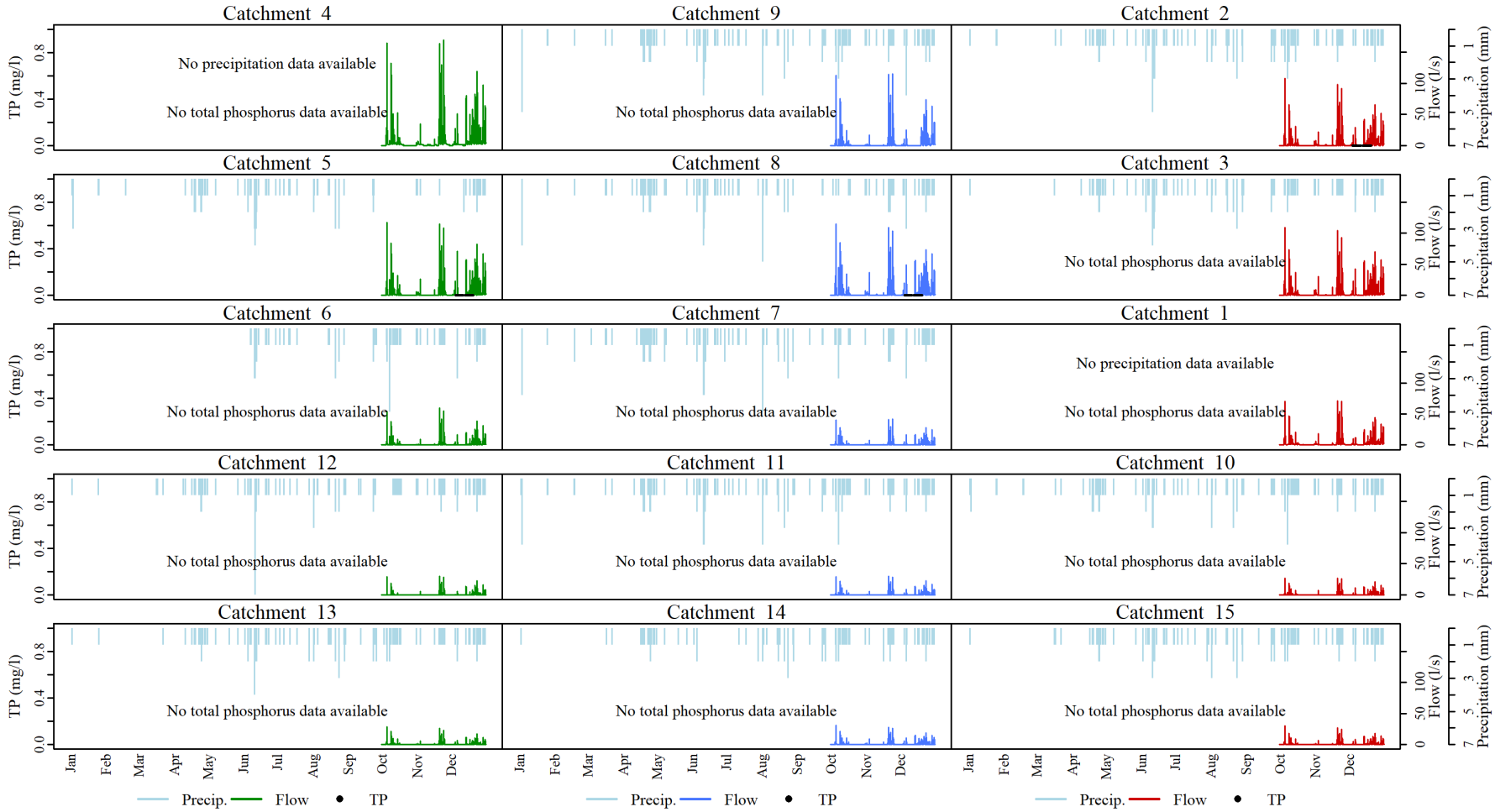


Figure 30: Time series of precipitation, flow and total phosphorus (TP)

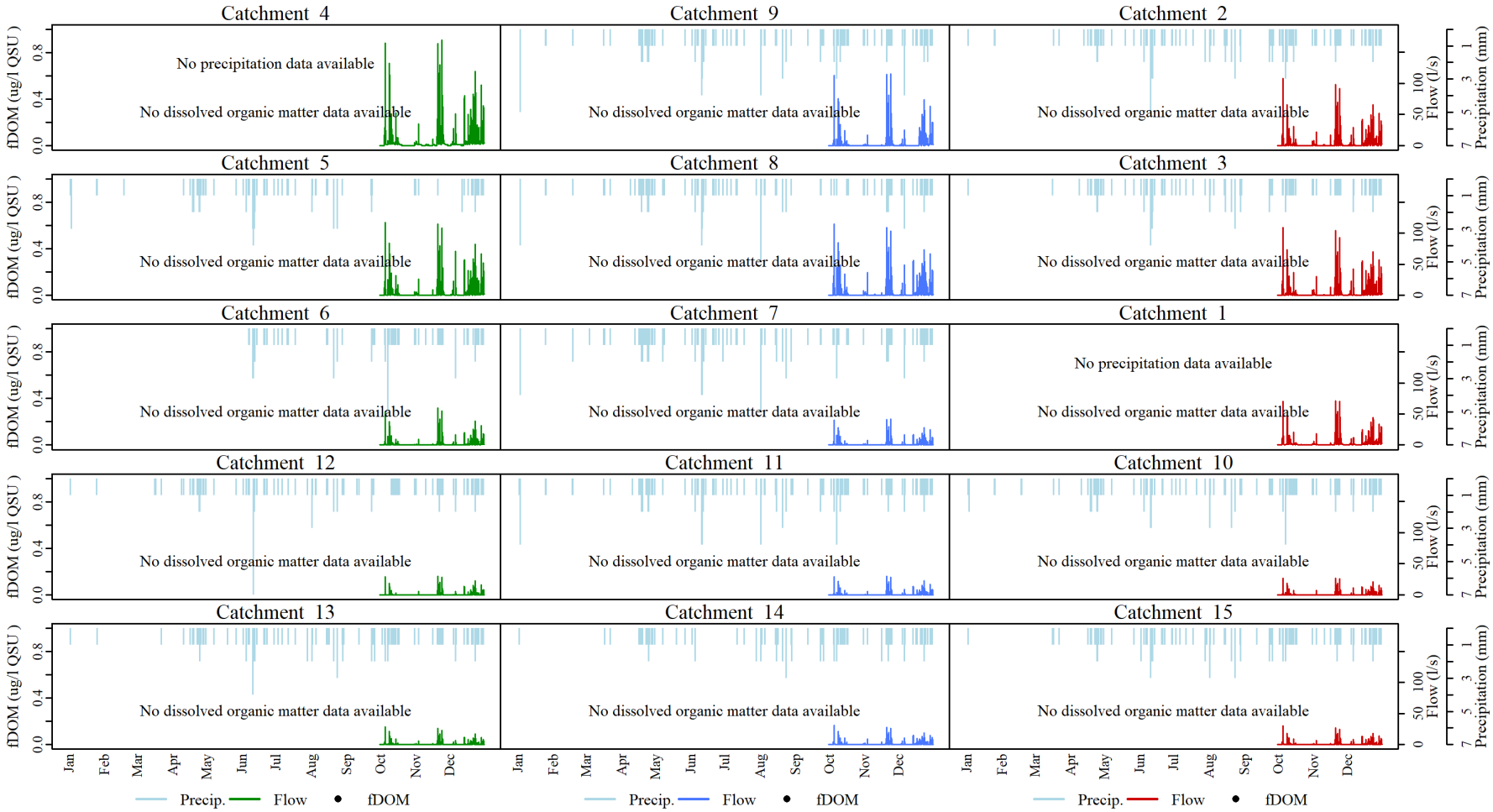


Figure 31: Time series of precipitation, flow and dissolved organic matter (fDOM)

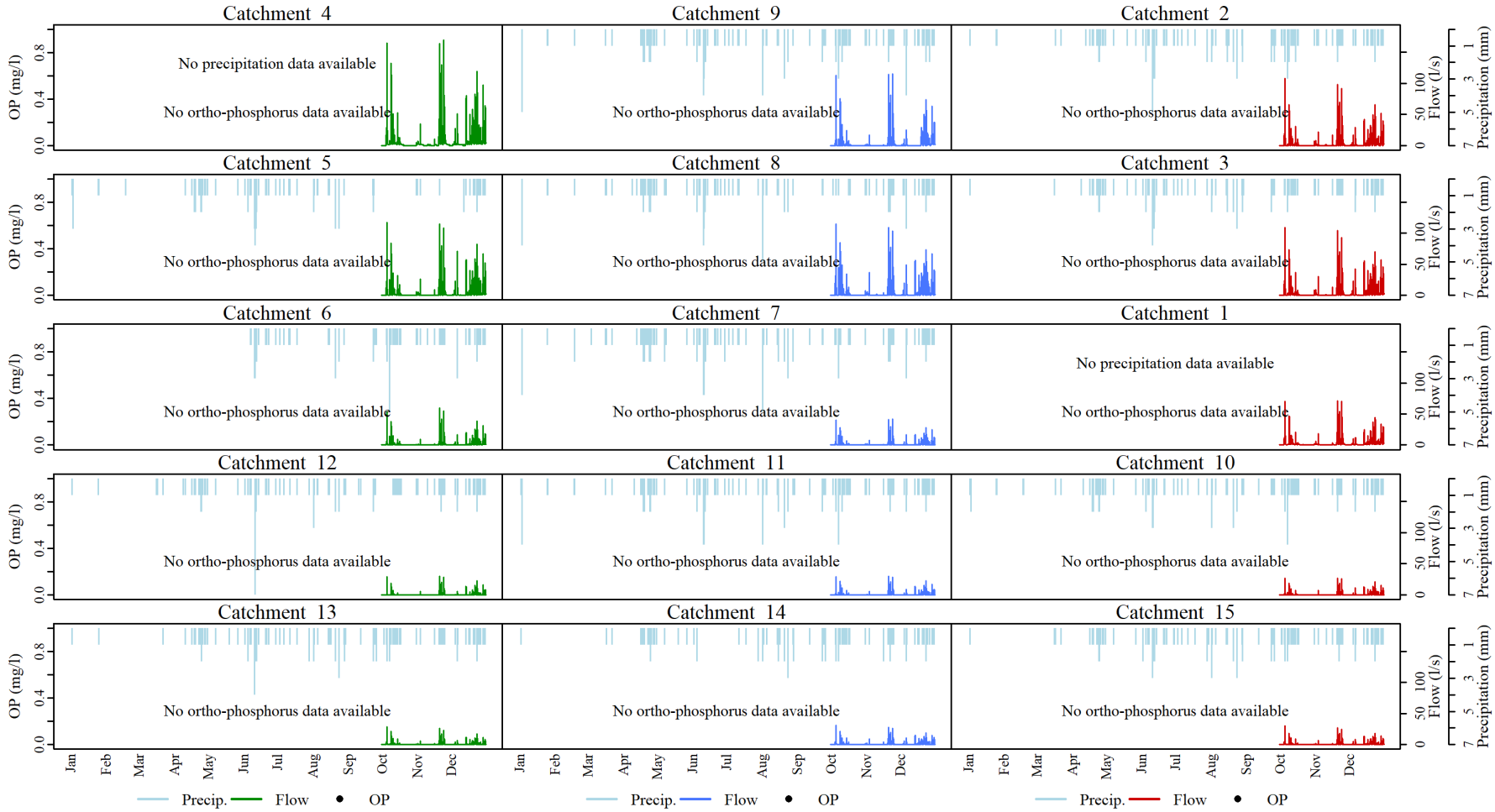


Figure 32: Time series of precipitation, flow and ortho-phosphorus (OP)

1.6 Correlations

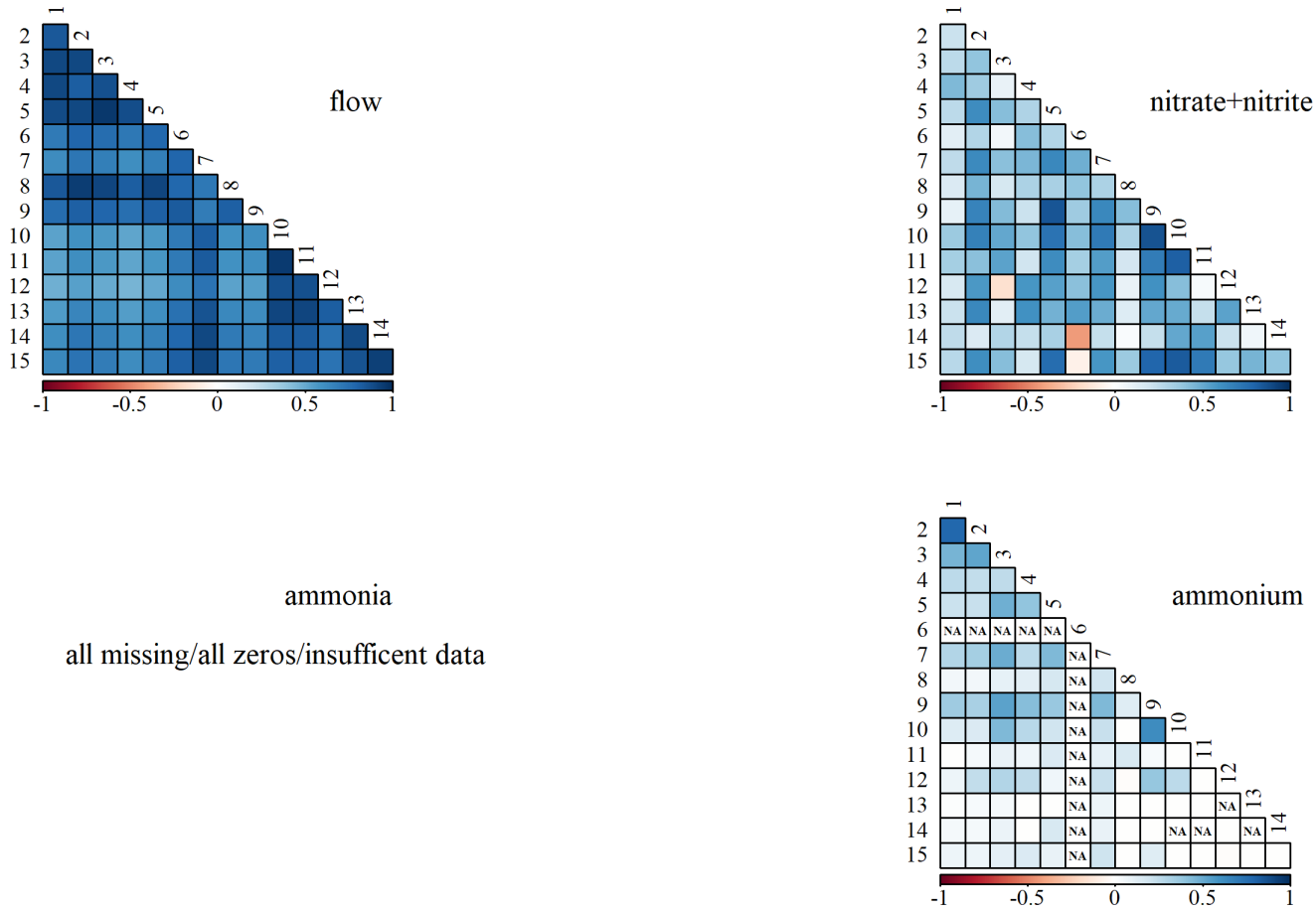


Figure 33: Correlations between catchments - flow, nitrate+nitrite, ammonia, ammonium

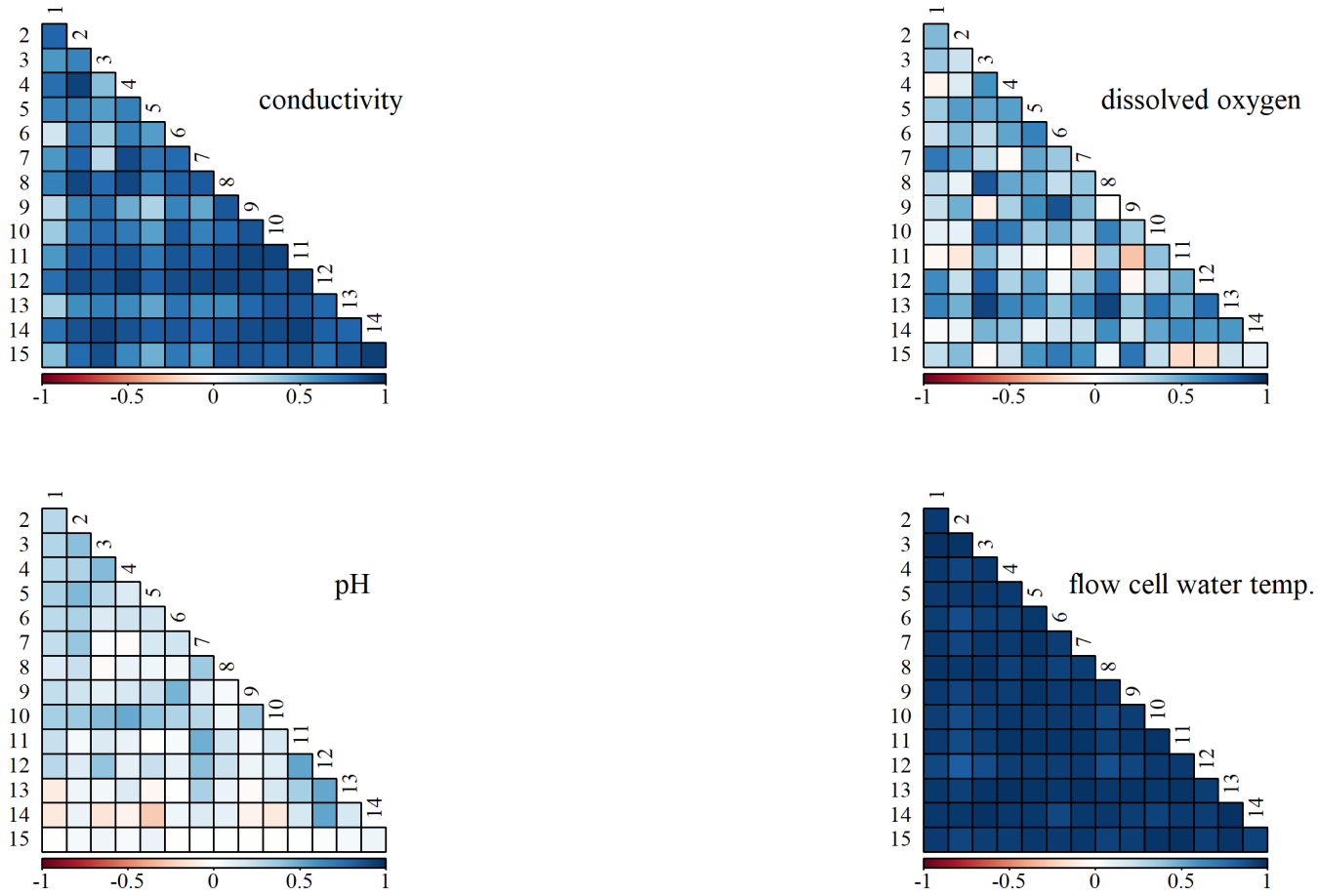
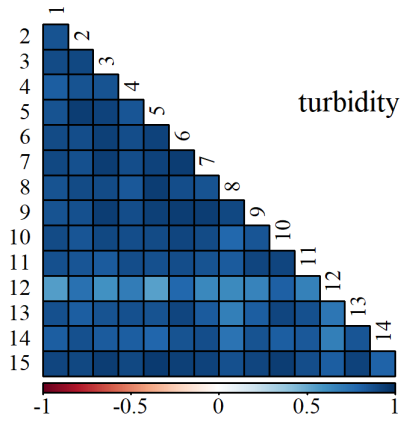


Figure 34: Correlations between catchments - conductivity, dissolved oxygen, pH, flow cell water temperature



total phosphorus

all missing/all zeros/insufficent data

dissolved org. matter

all missing/all zeros/insufficent data

ortho-phosphorus

all missing/all zeros/insufficent data

Figure 35: Correlations between catchments - turbidity, total phosphorus, dissolved organic matter, ortho-phosphorus

2 MONTHLY

2.1 Flow duration curves

Data are in triplet/catchment order with catchments arranged from largest to smallest across the page. NB. Data may include missing values.

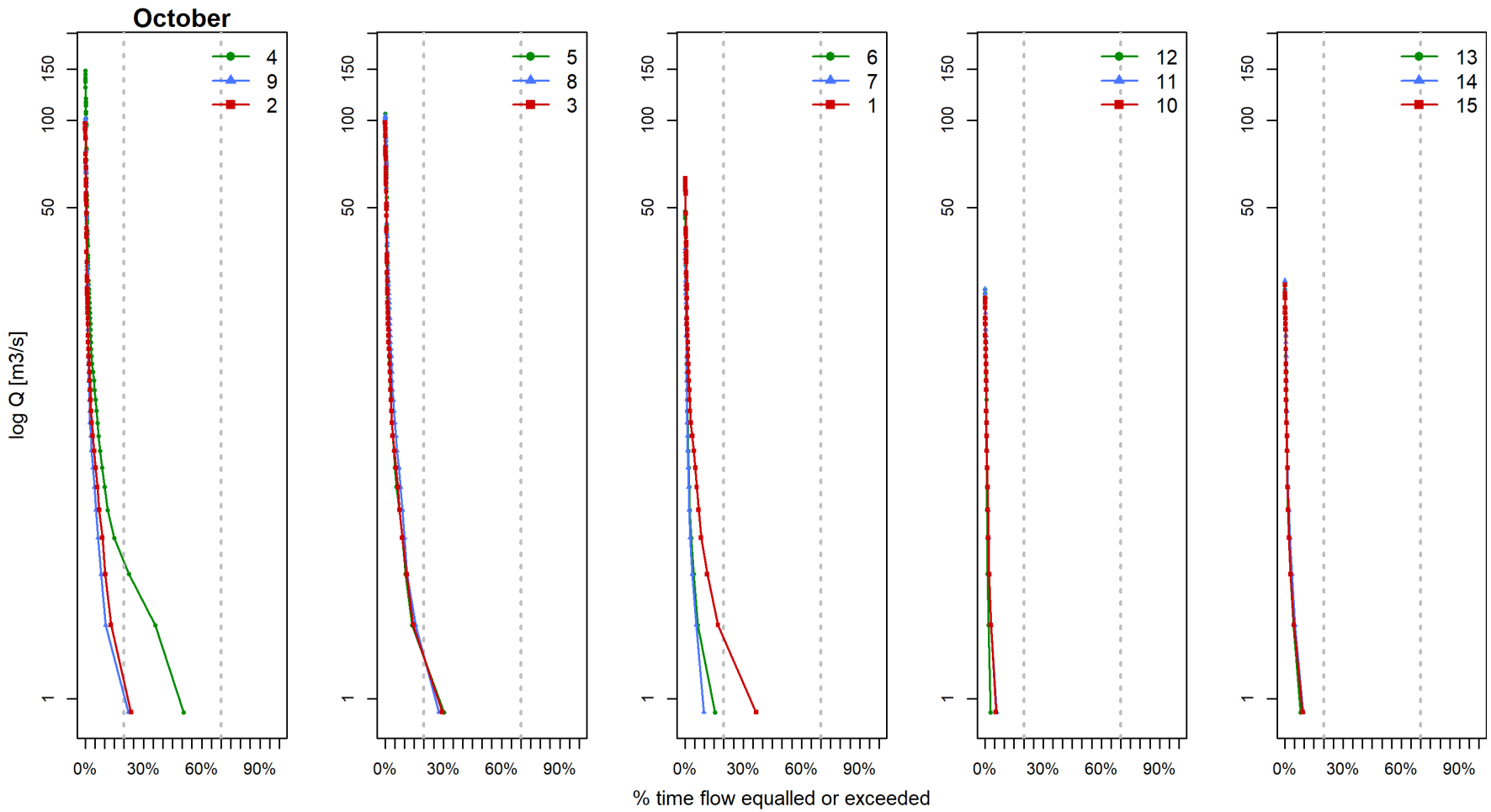


Figure 36: Flow duration curves for January

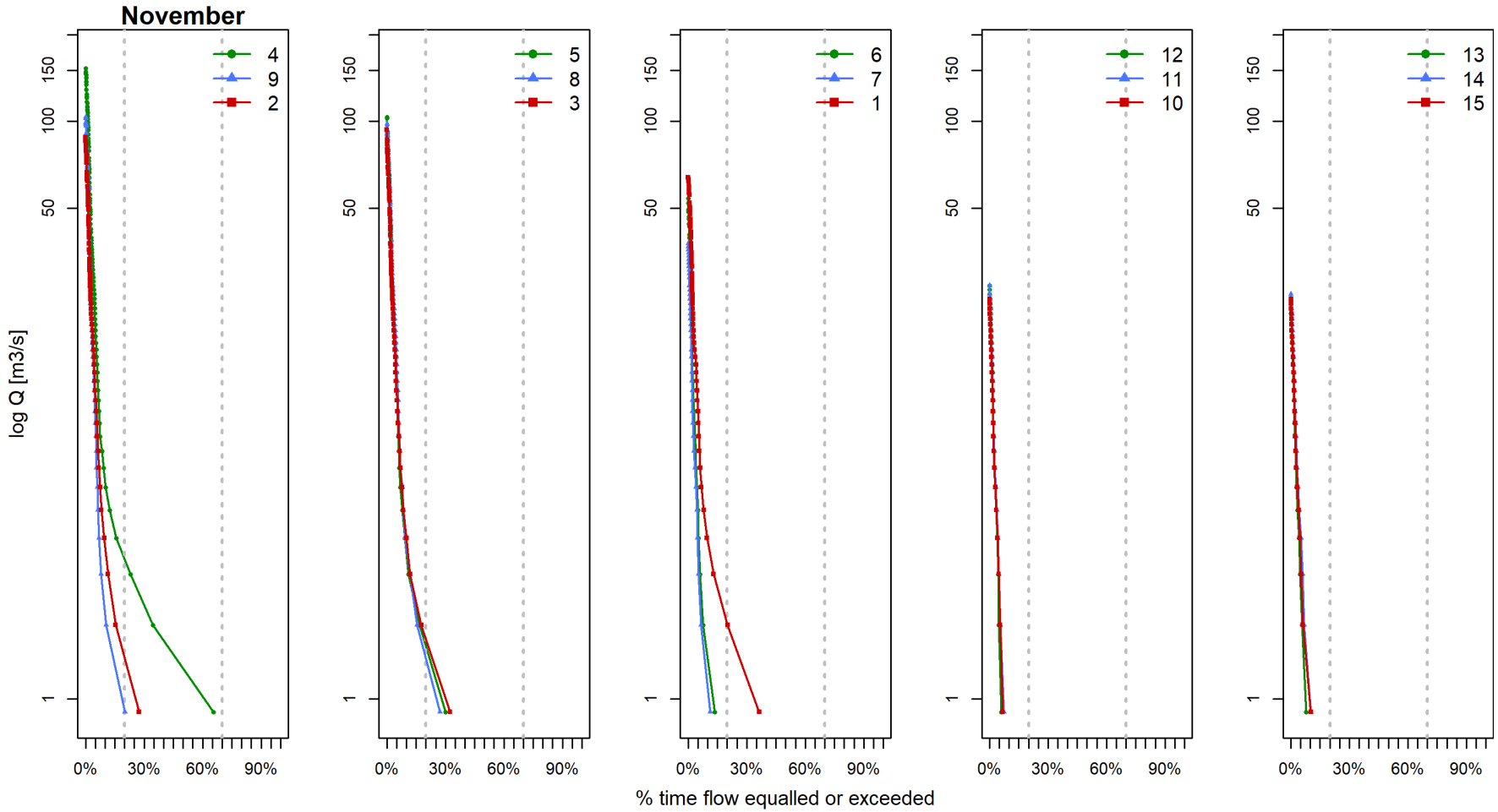


Figure 37: Flow duration curves for February

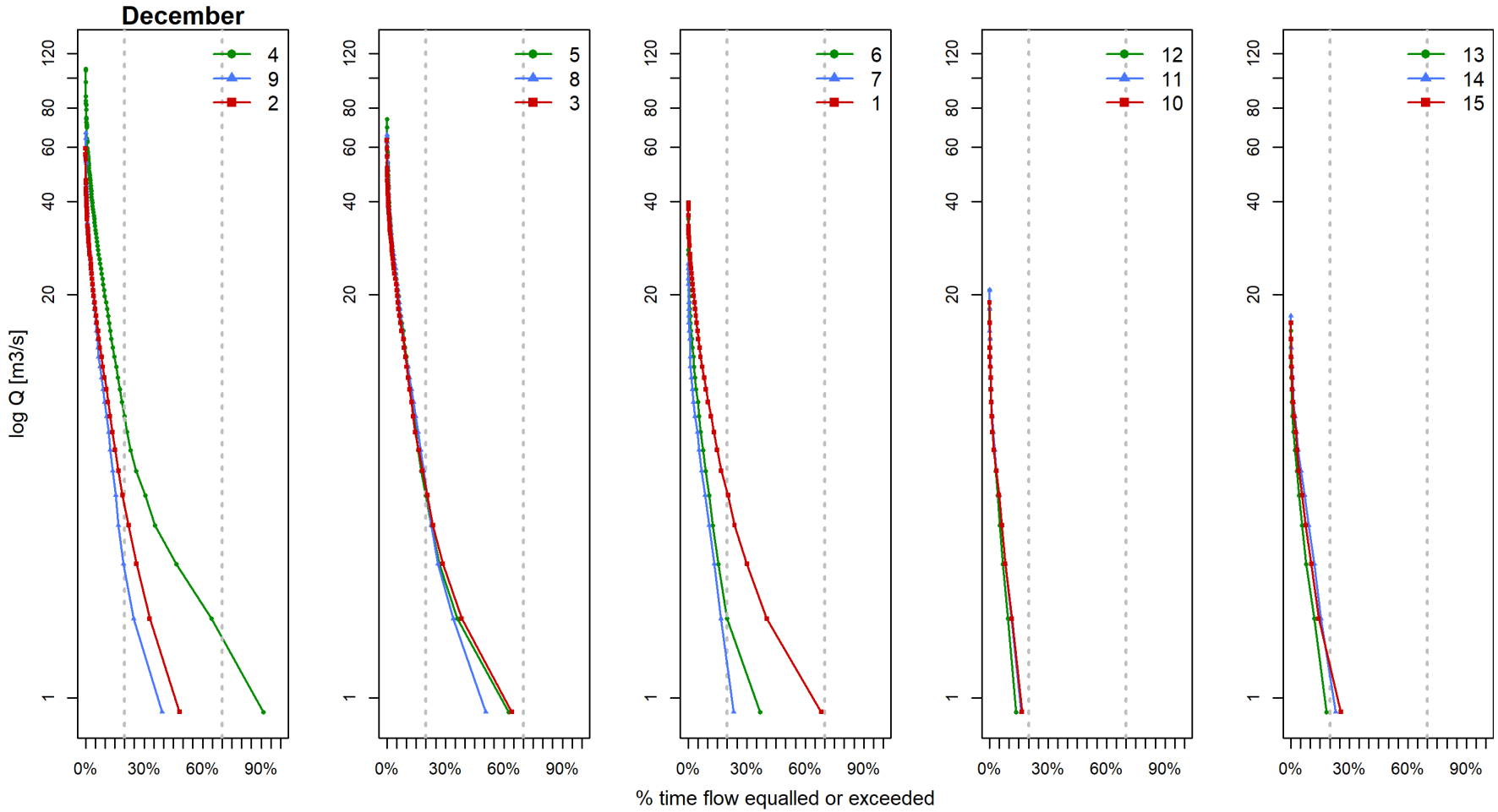


Figure 38: Flow duration curves for March

2.2 Means

Please be aware that the means are based on data that may contain missing values. Full data summaries are available on request.

Vertical lines = positive standard error of the mean. Values above bars = number of observations.

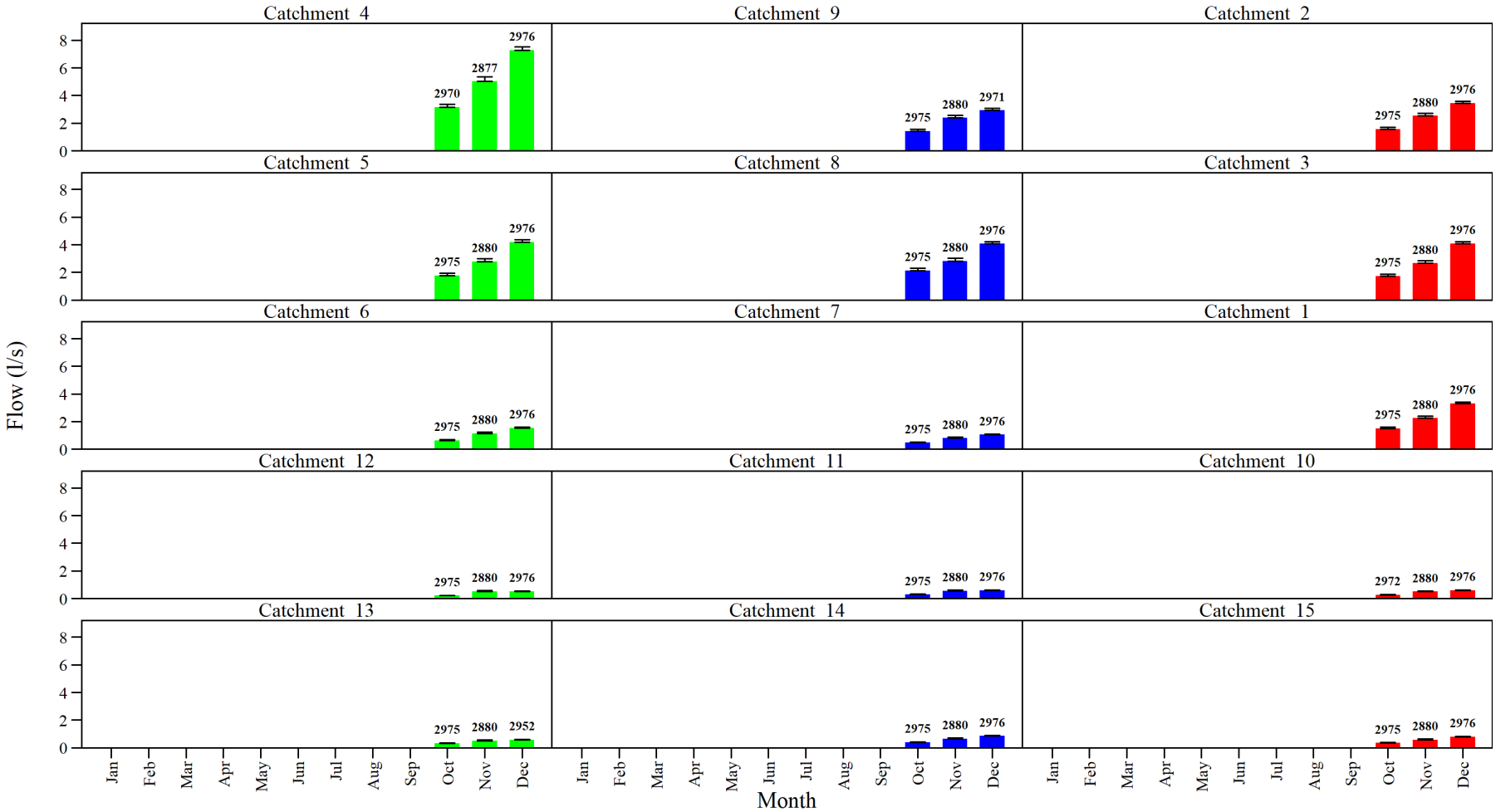


Figure 39: Monthly means for flow

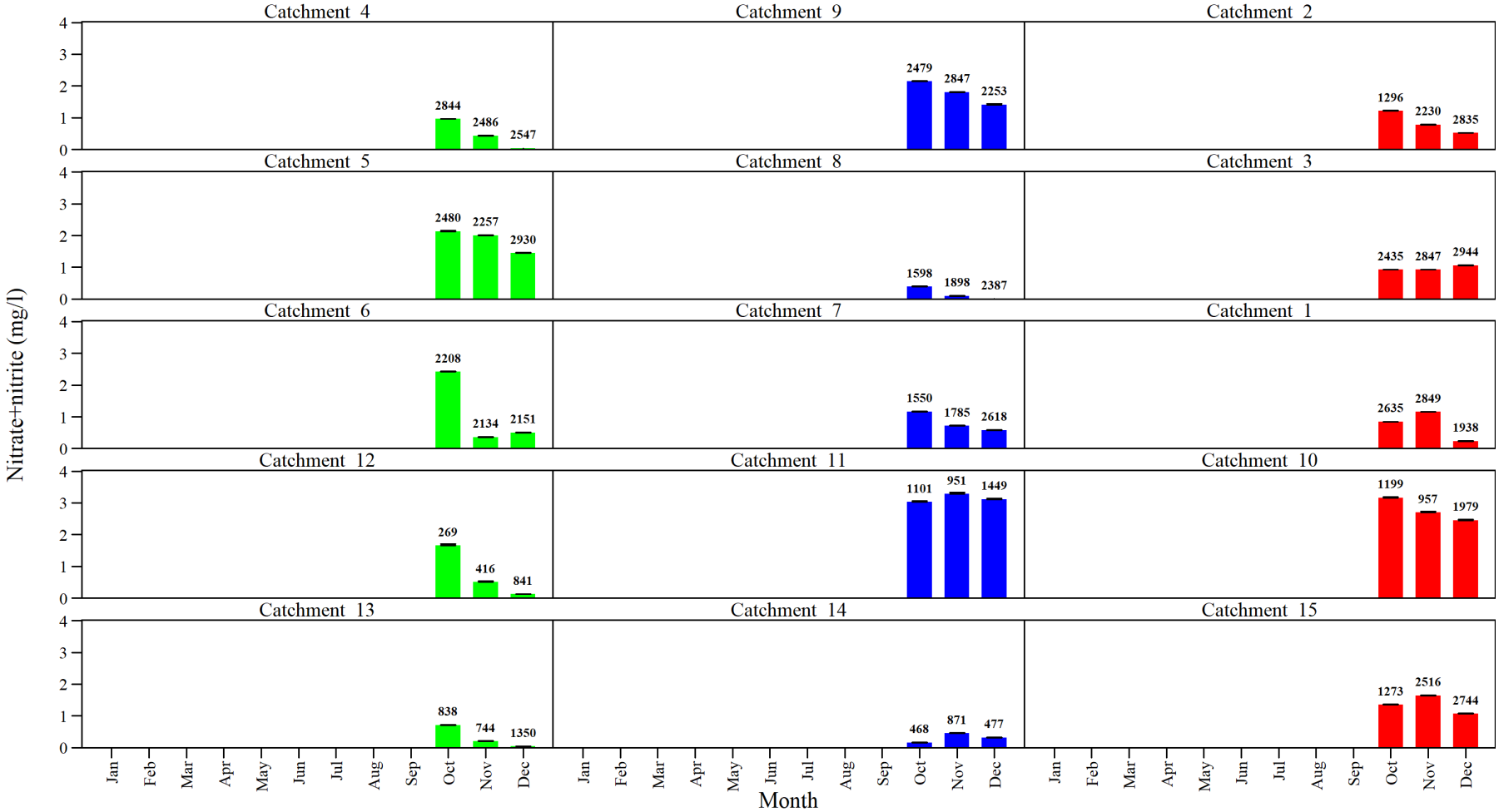


Figure 40: Monthly means for nitrate+nitrite

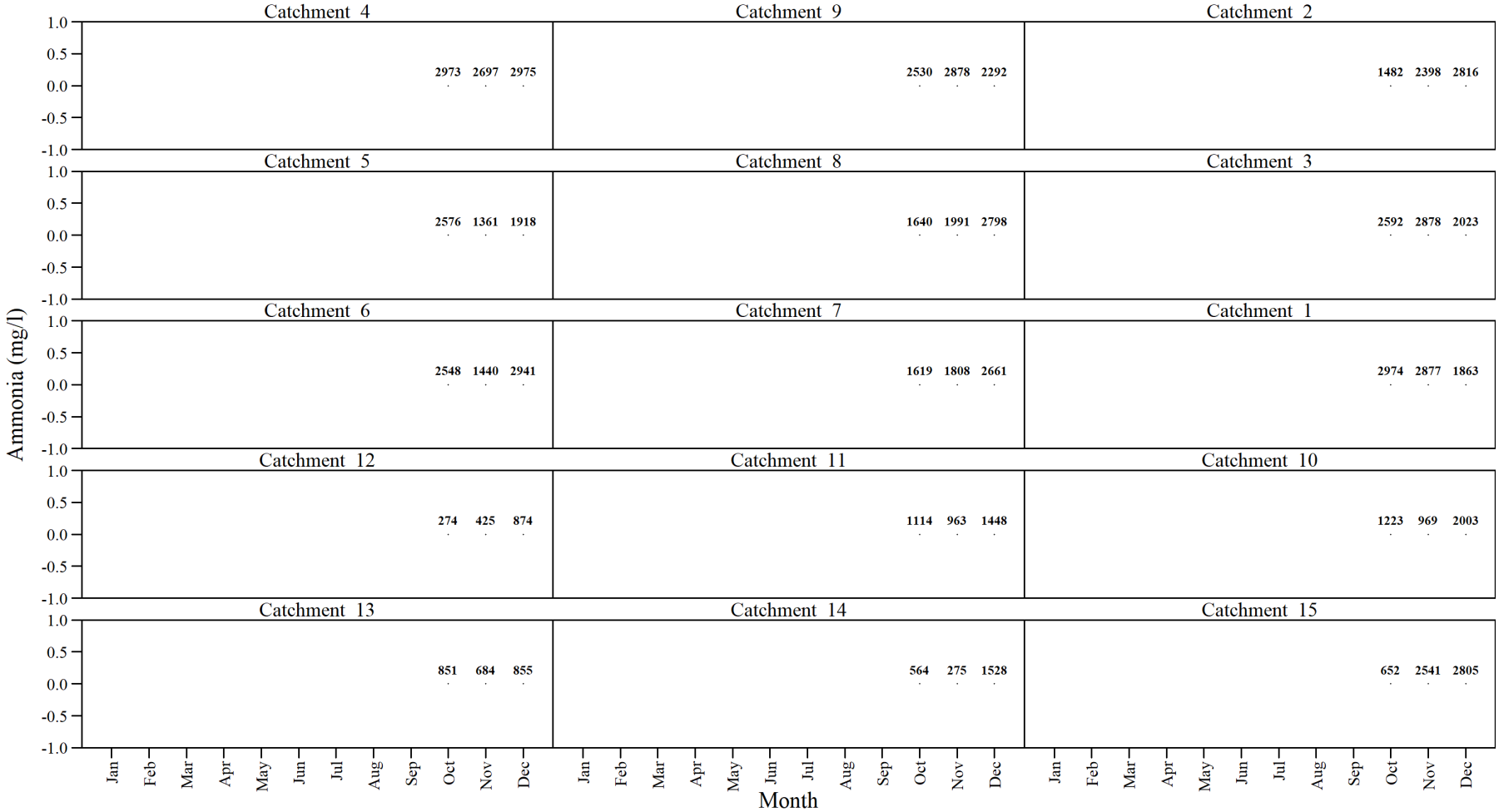


Figure 41: Monthly means for ammonia

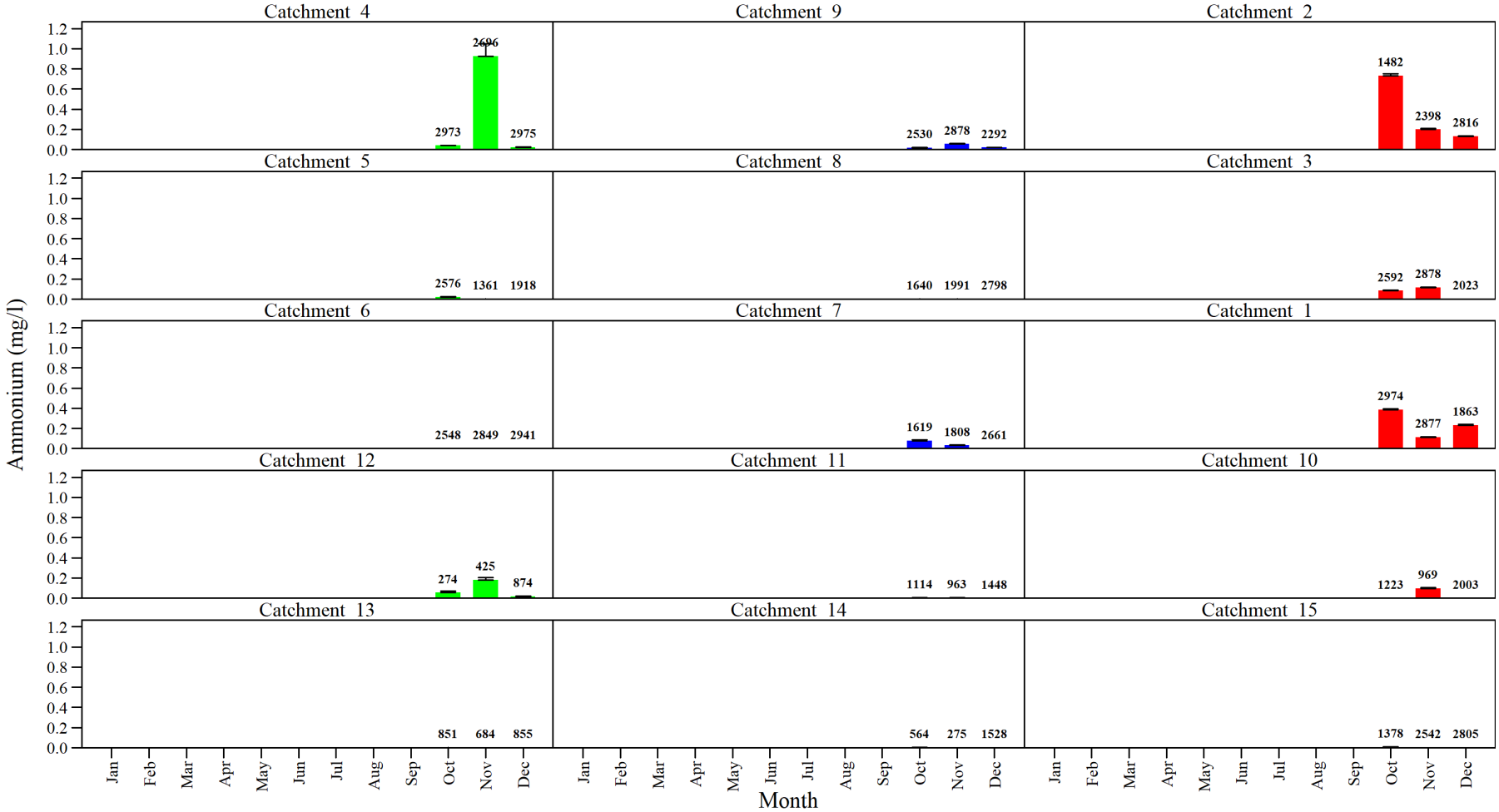


Figure 42: Monthly means for ammonium

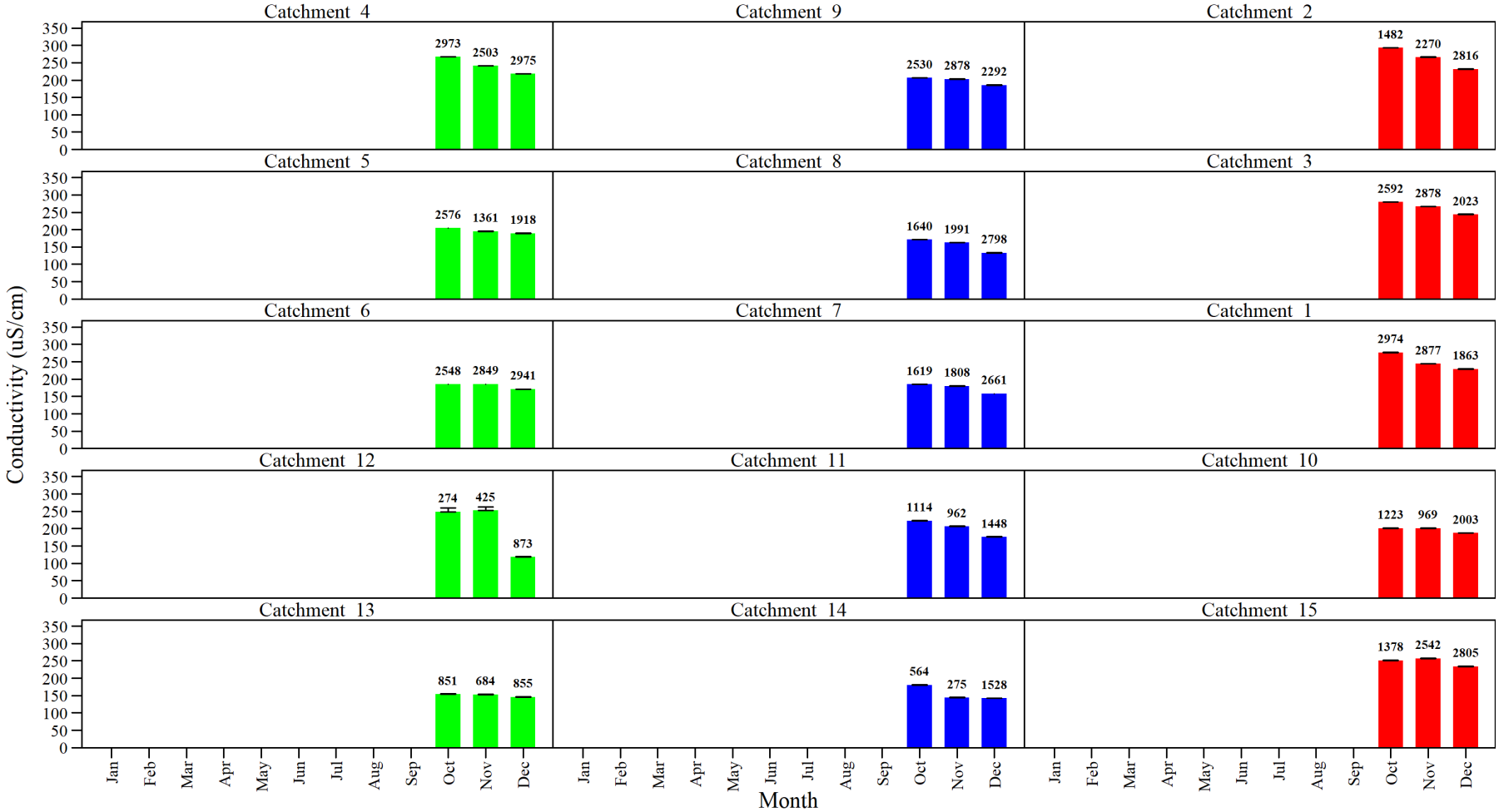


Figure 43: Monthly means for conductivity

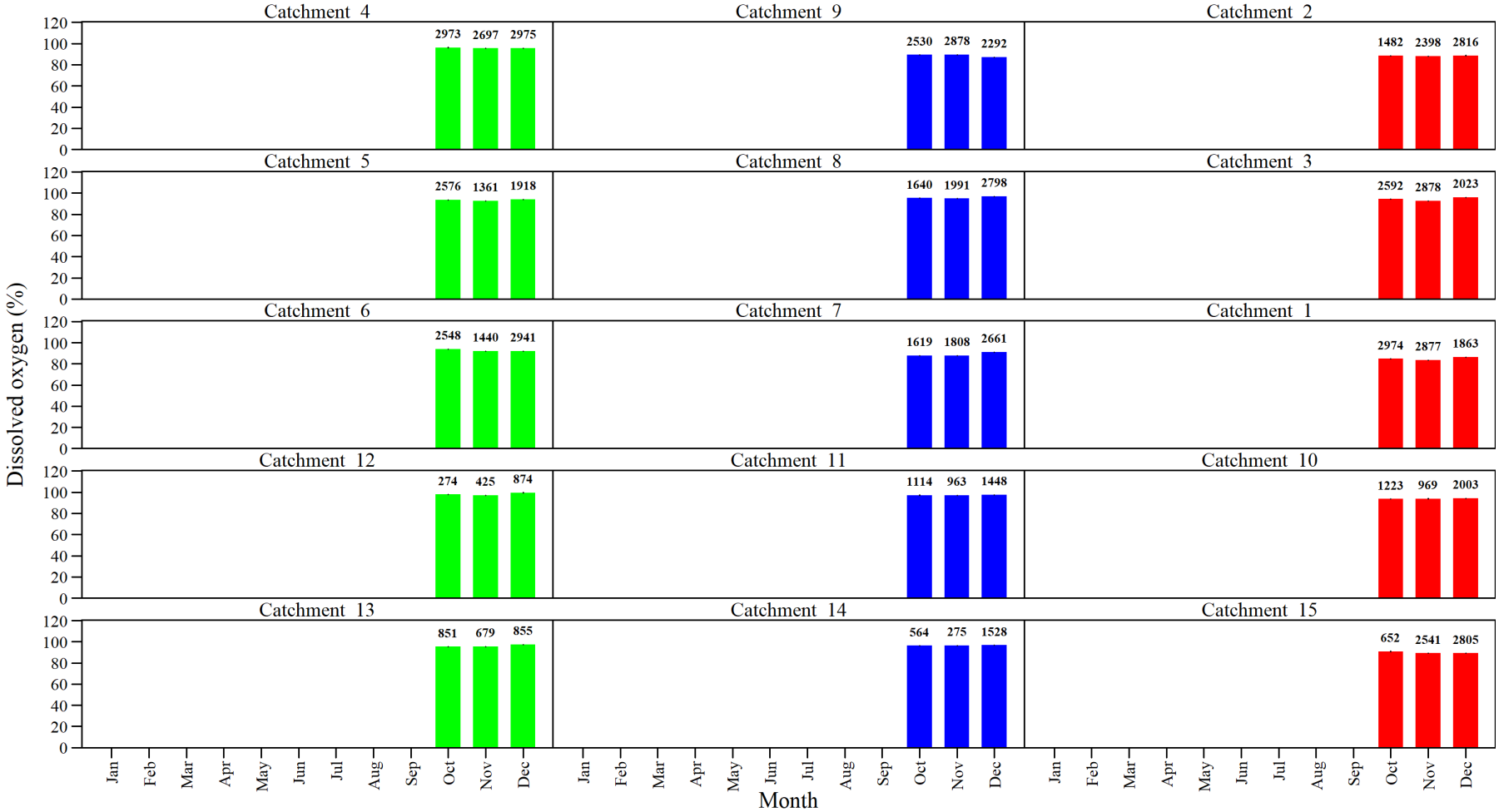


Figure 44: Monthly means for dissolved oxygen

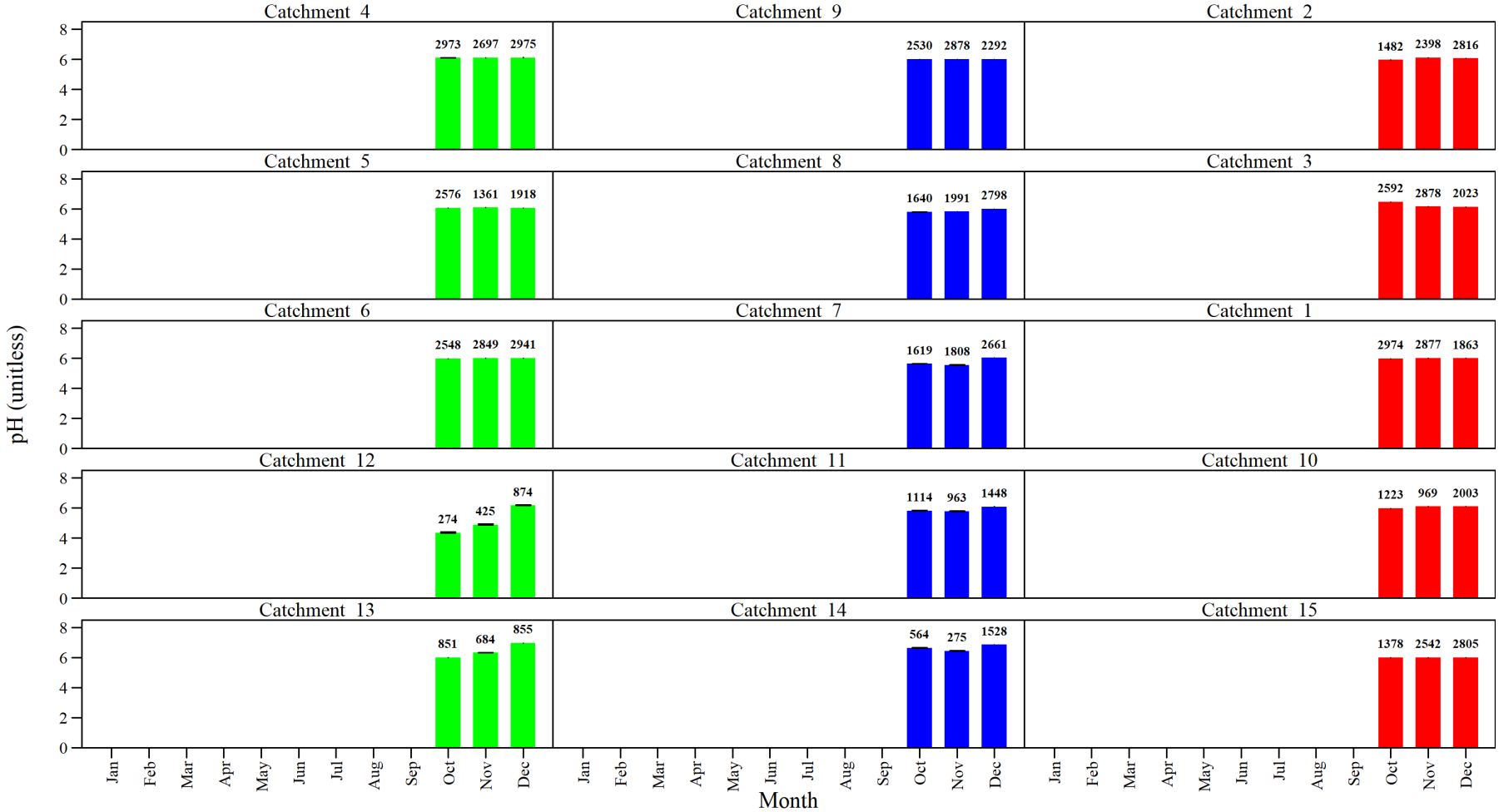


Figure 45: Monthly means for pH

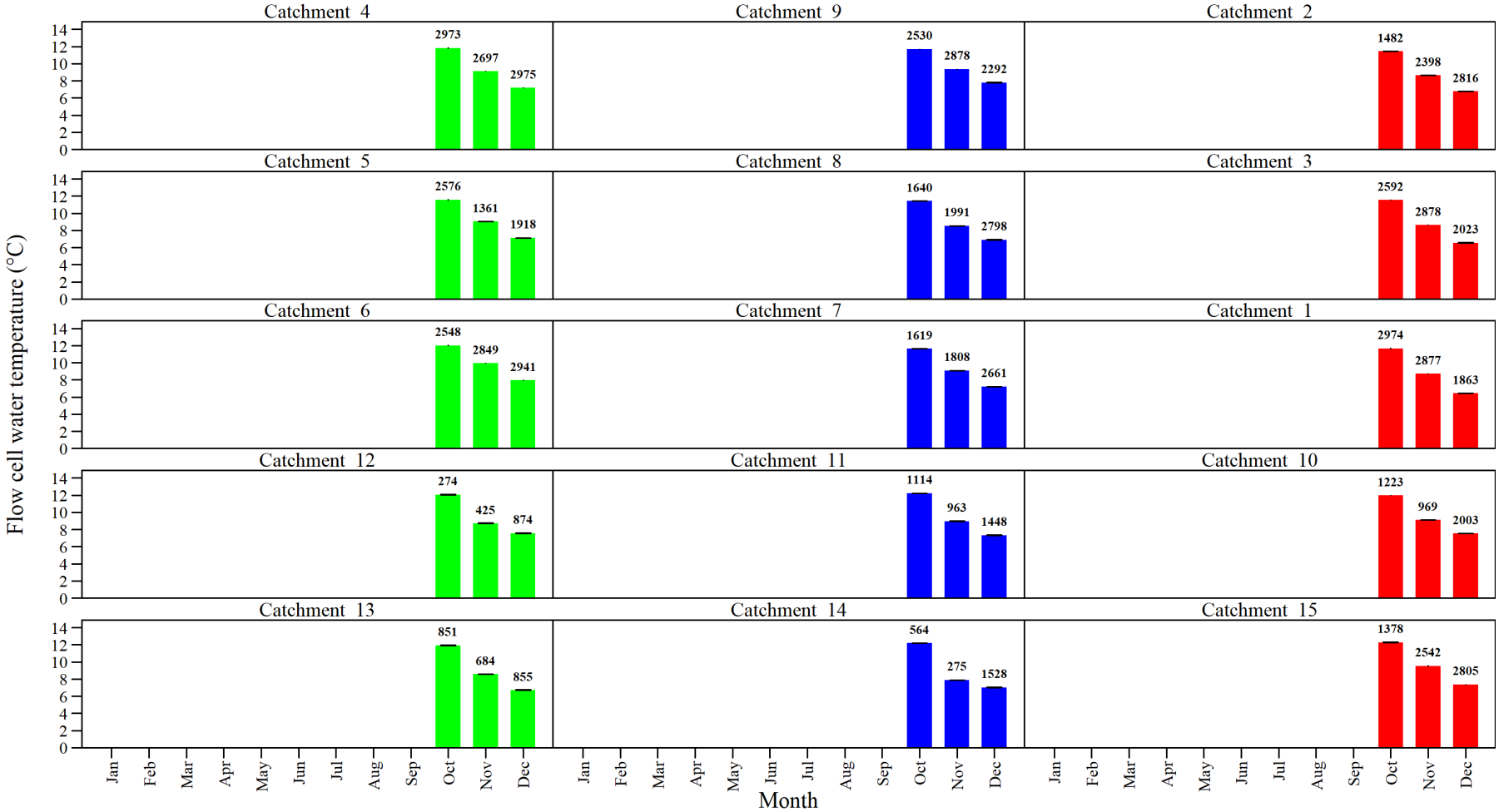


Figure 46: Monthly means for flow cell water temperature

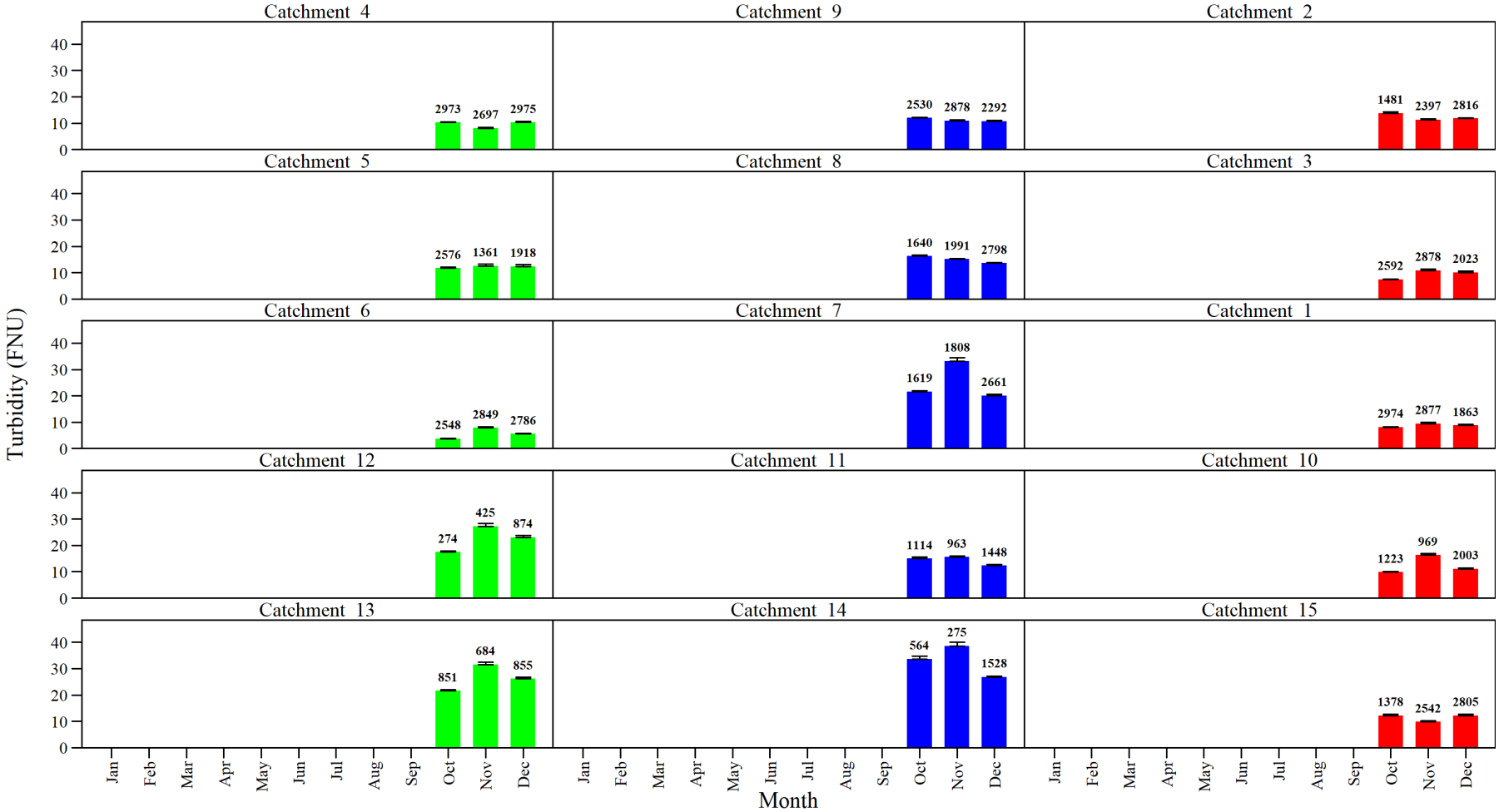


Figure 47: Monthly means for turbidity

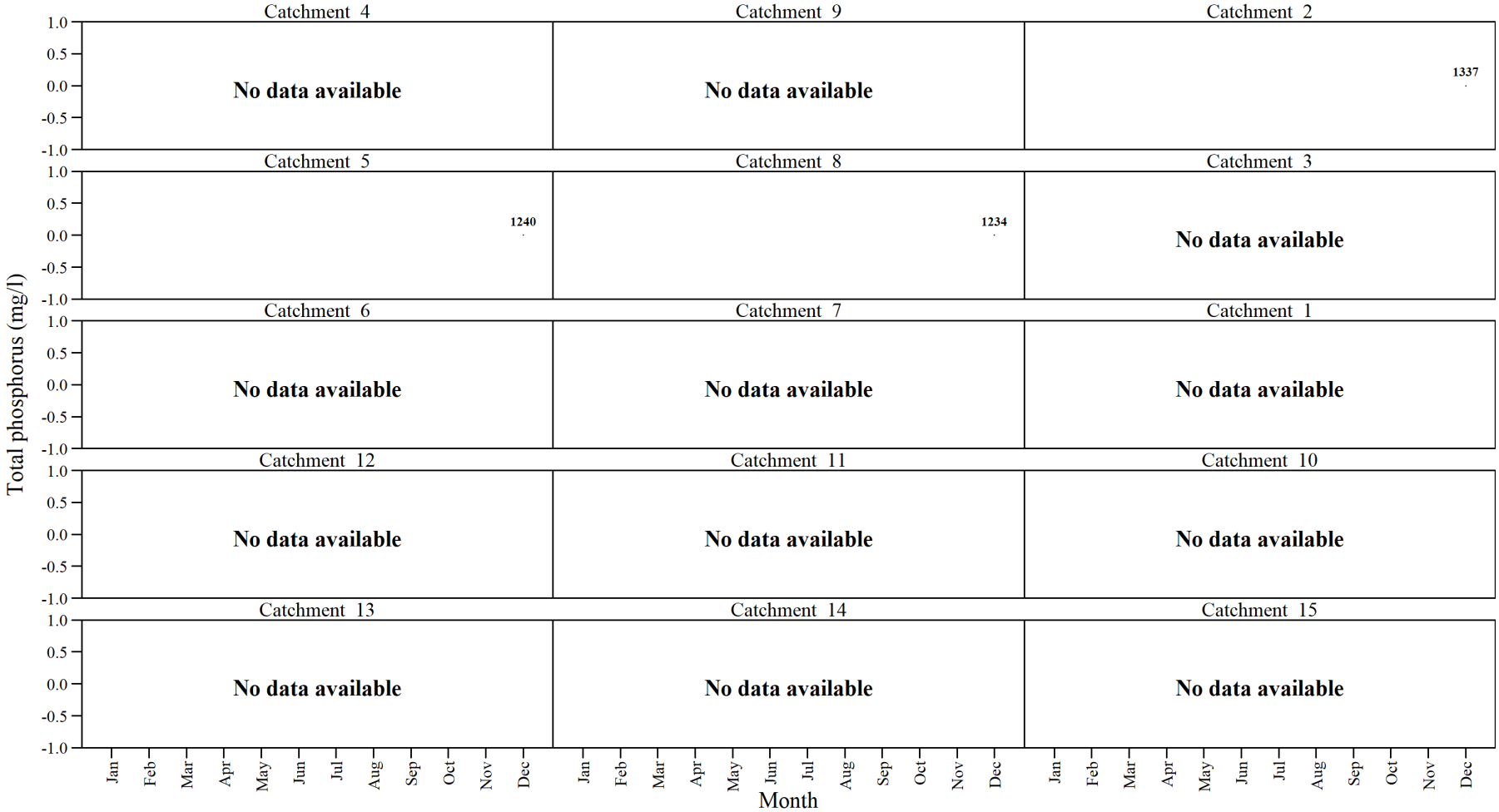


Figure 48: Monthly means for total phosphorus

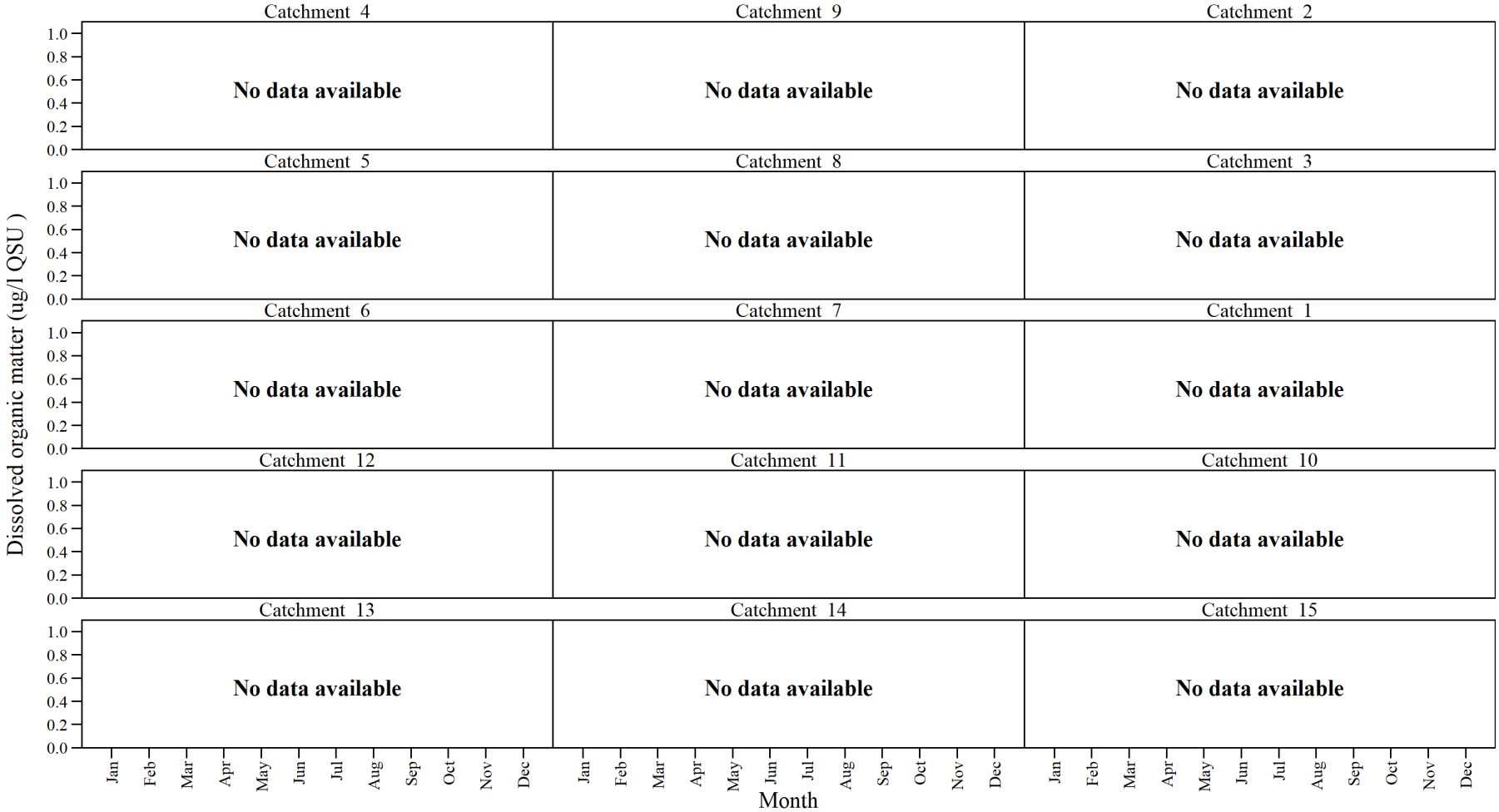


Figure 49: Monthly means for dissolved organic matter

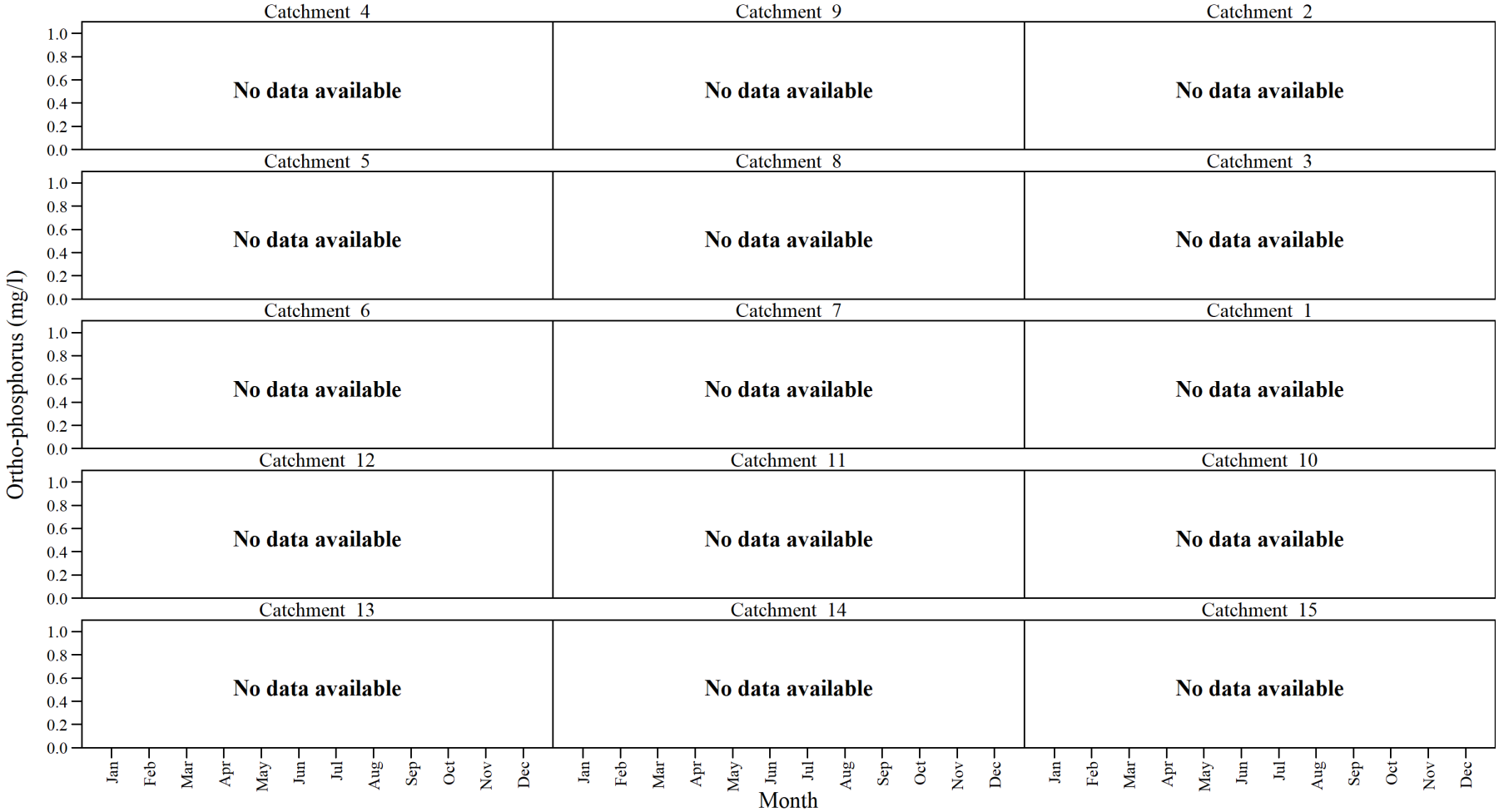


Figure 50: Monthly means for ortho-phosphorus

2.3 Chloropleth maps of means

Grey areas represent missing data

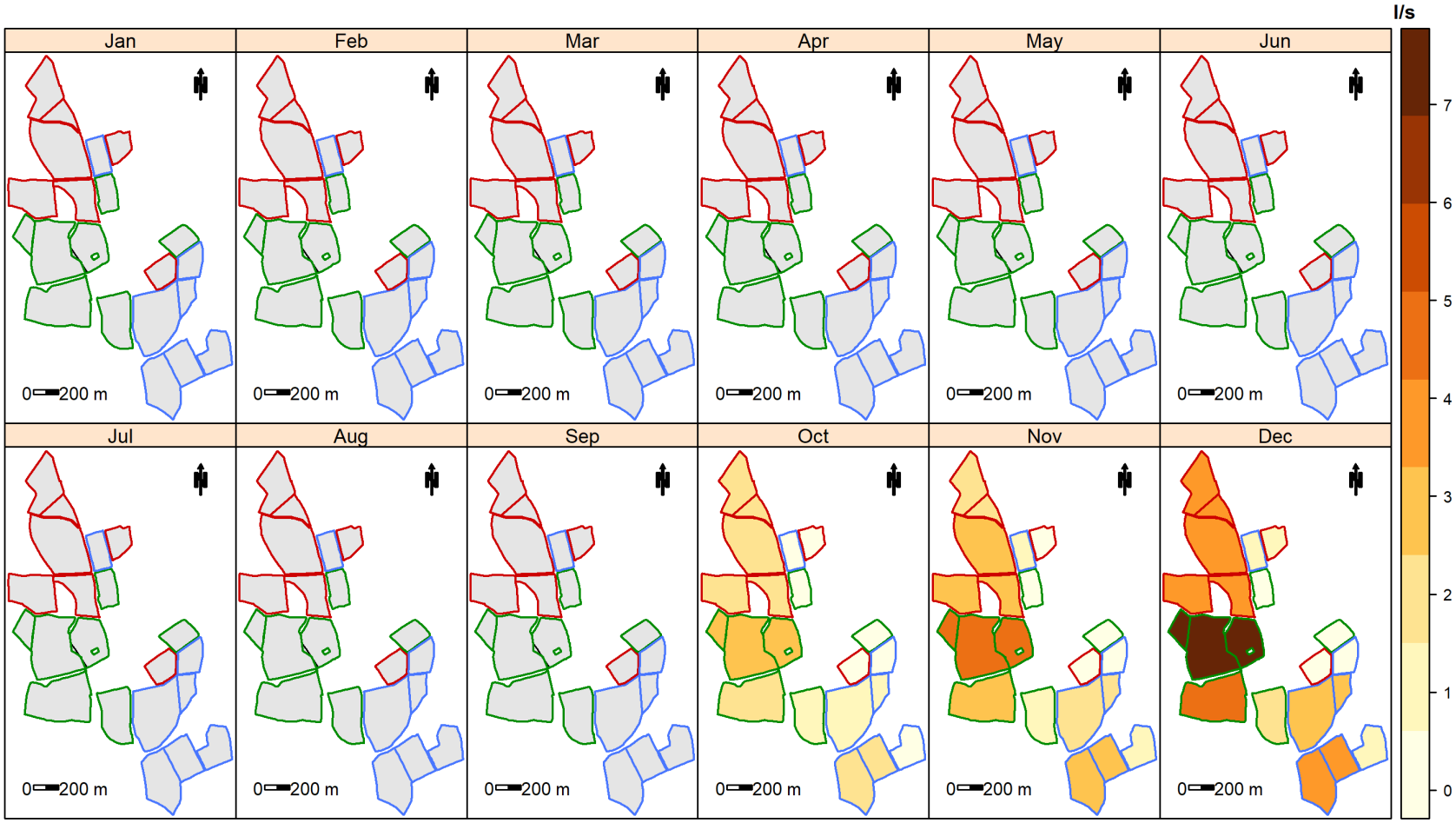


Figure 51: Mapped means for flow

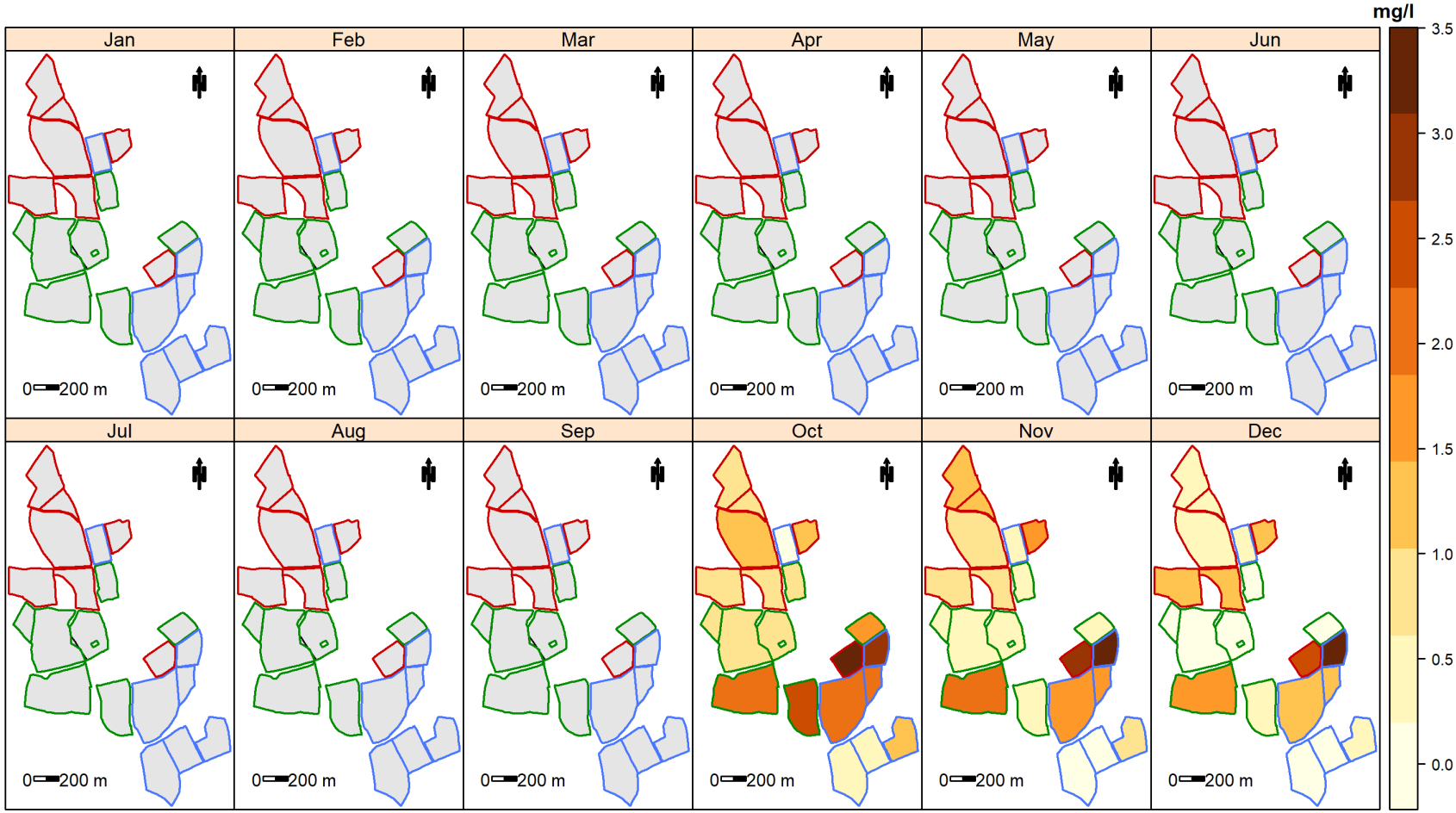


Figure 52: Mapped means for nitrate+nitrite

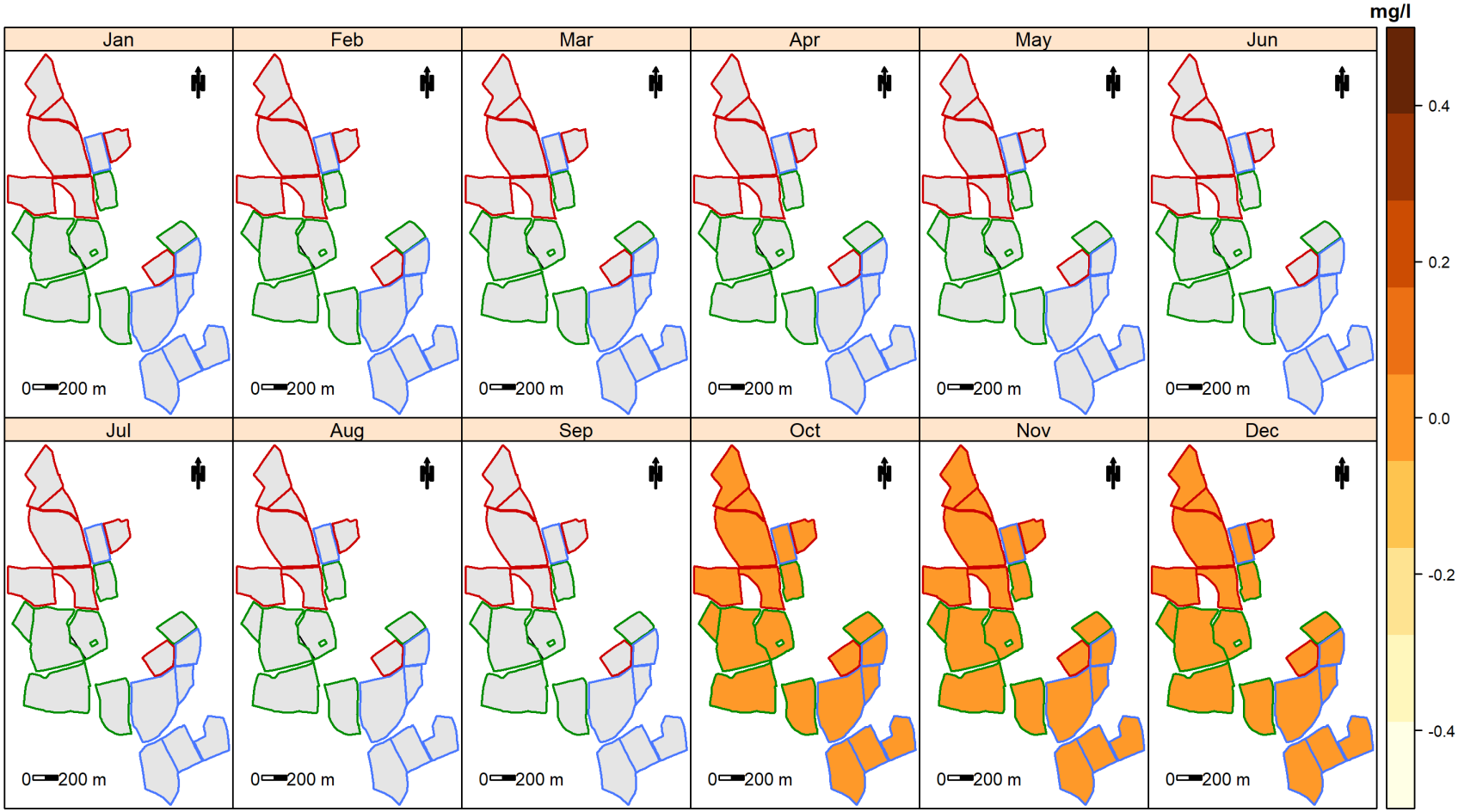


Figure 53: Mapped means for ammonia

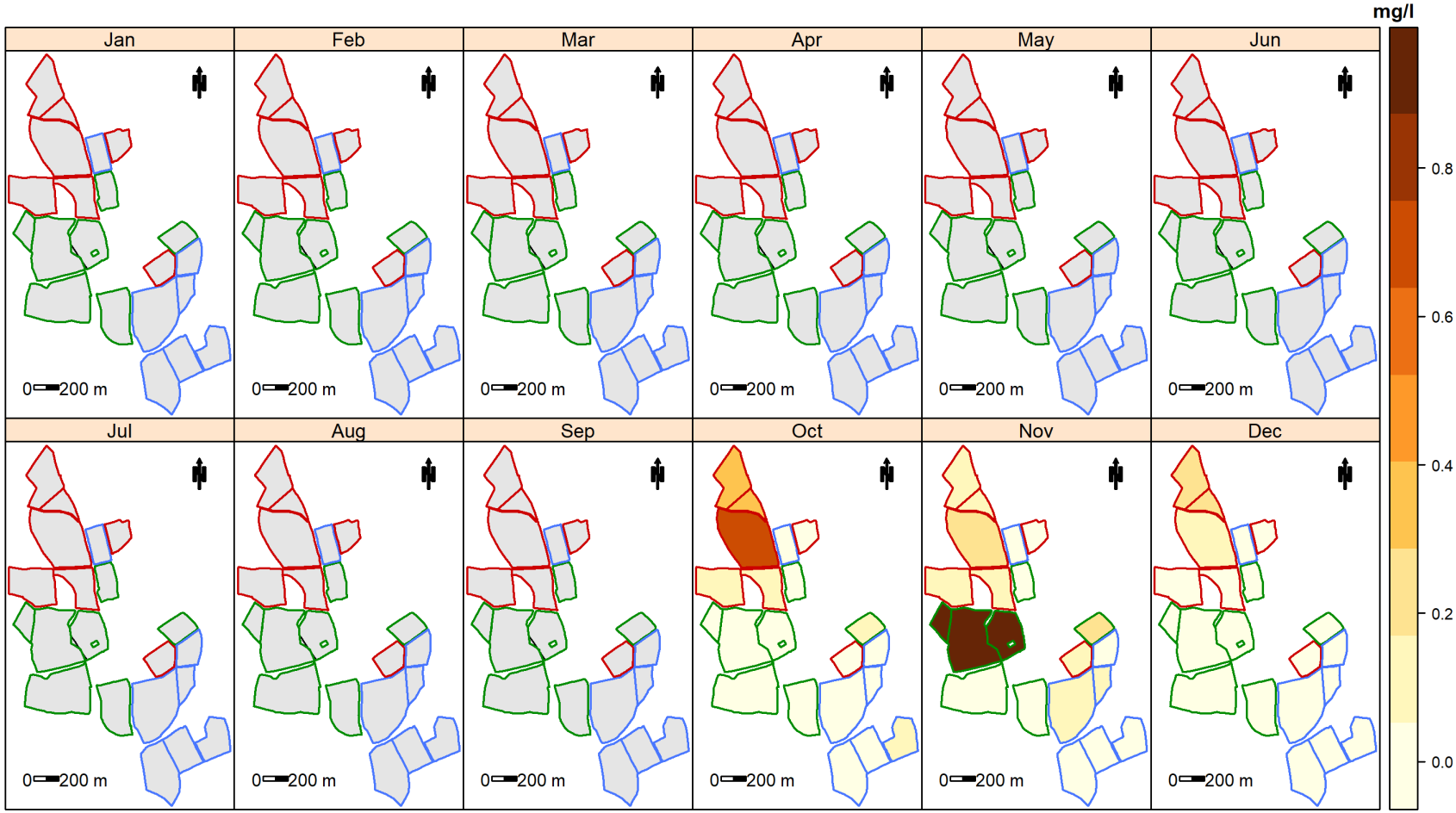


Figure 54: Mapped means for ammonium

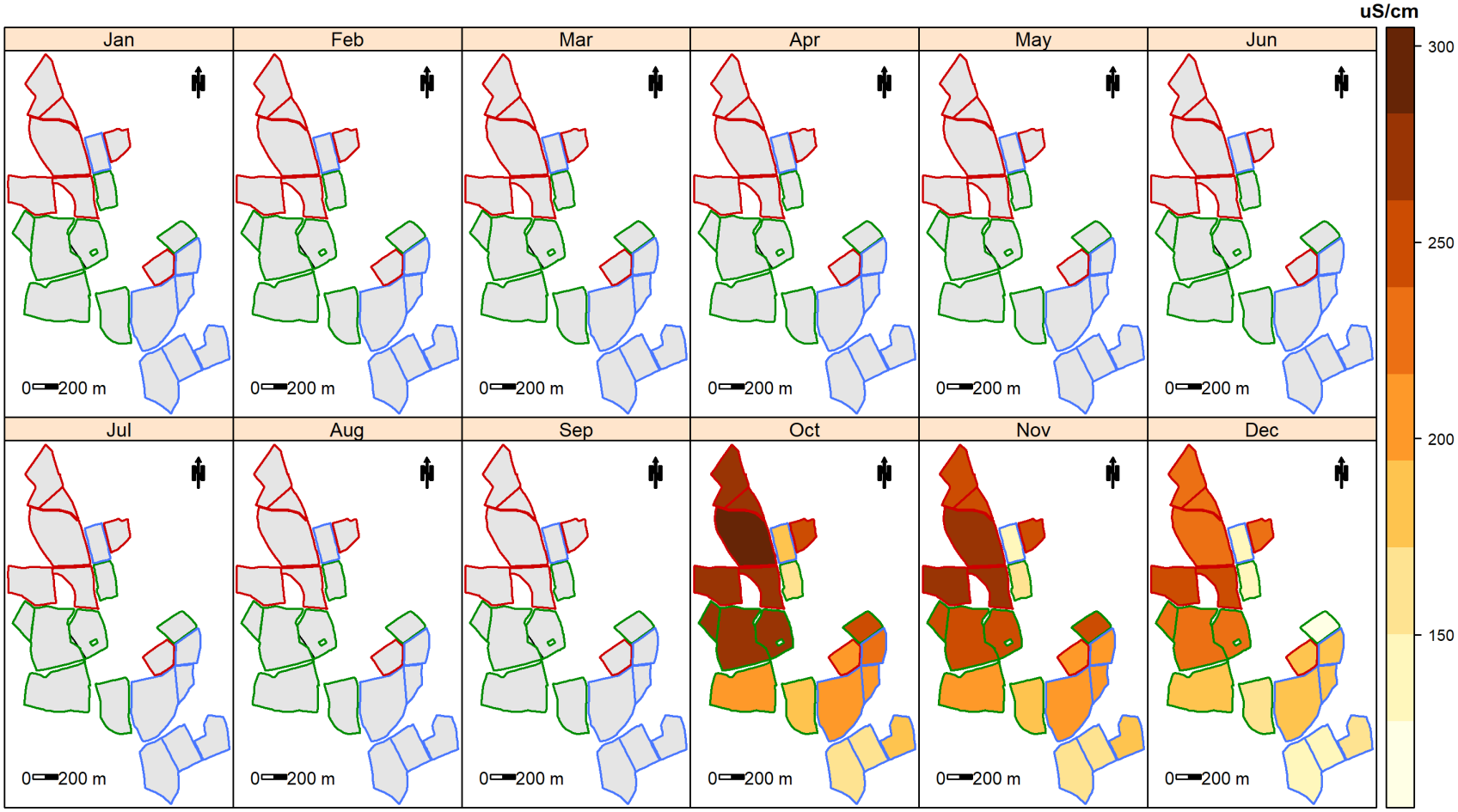


Figure 55: Mapped means for conductivity

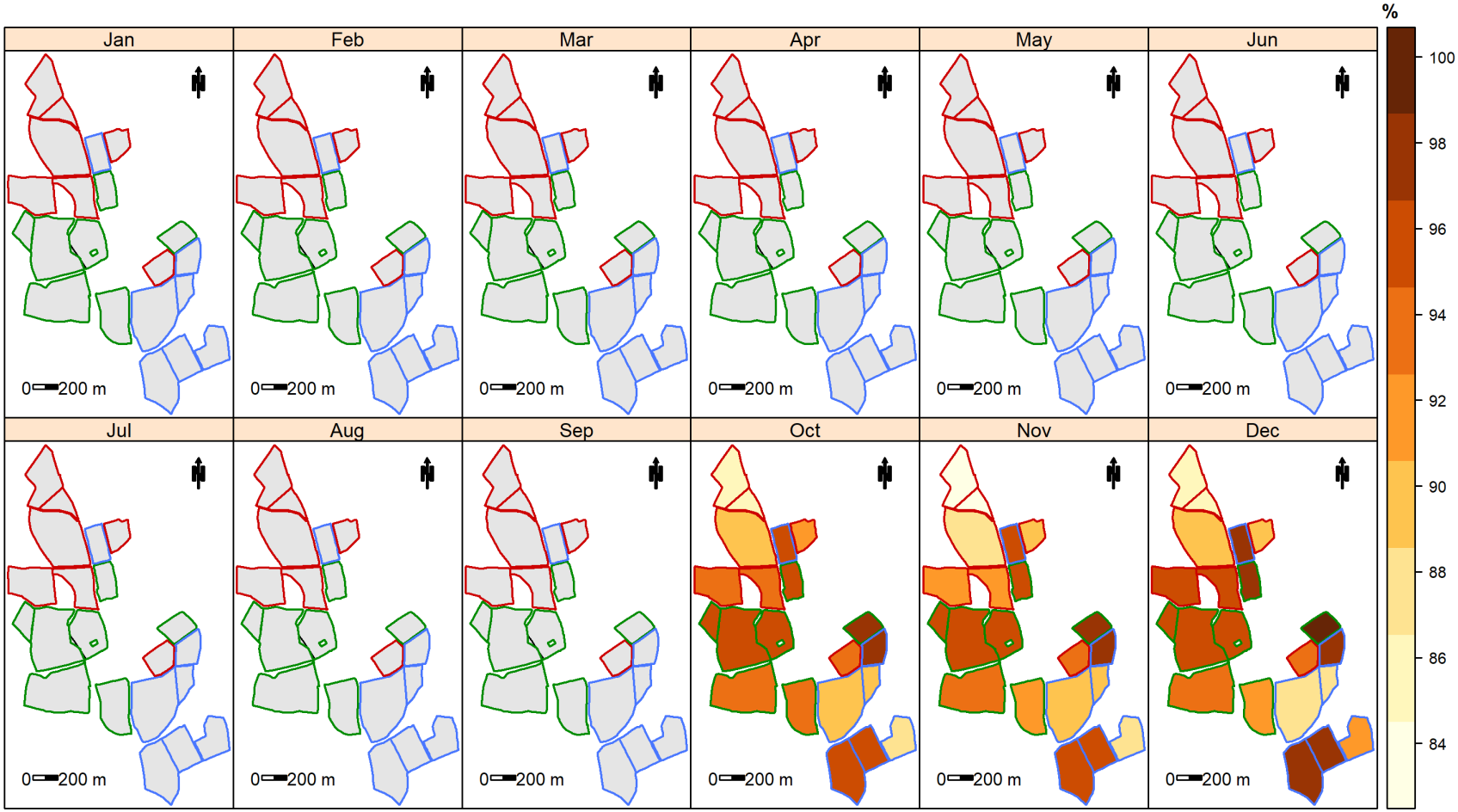


Figure 56: Mapped means for dissolved oxygen

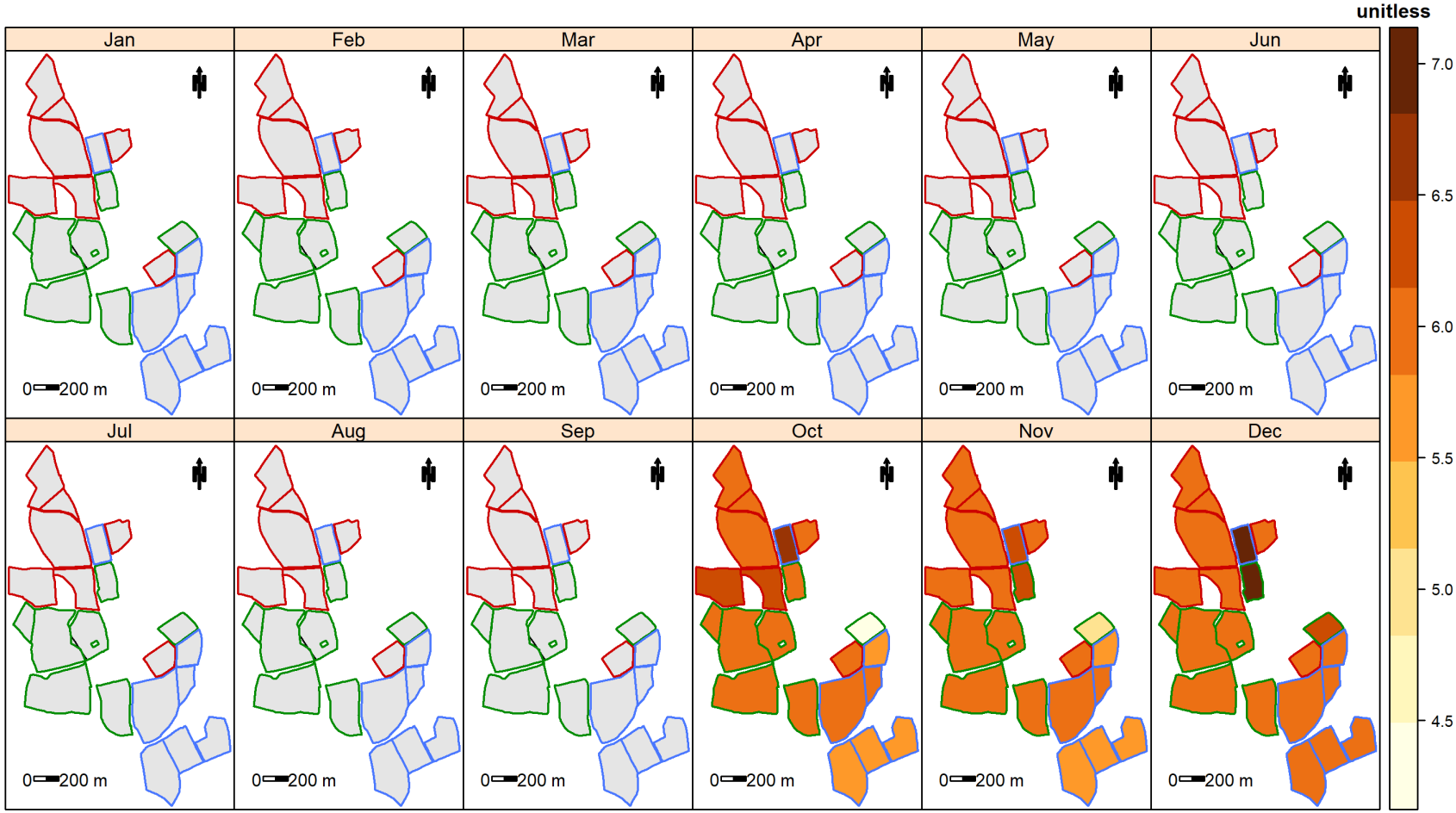


Figure 57: Mapped means for pH

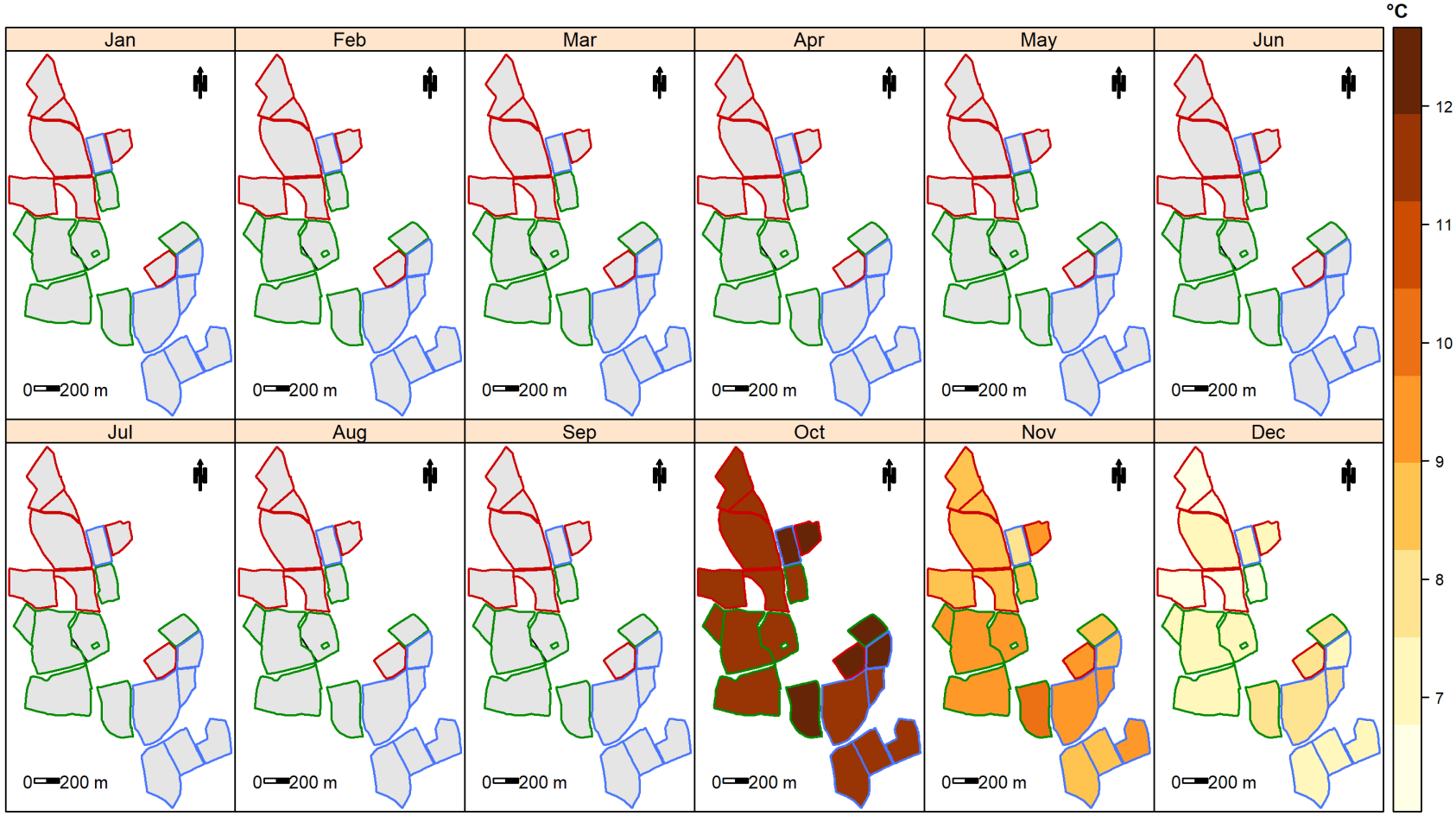


Figure 58: Mapped means for flow cell water temperature

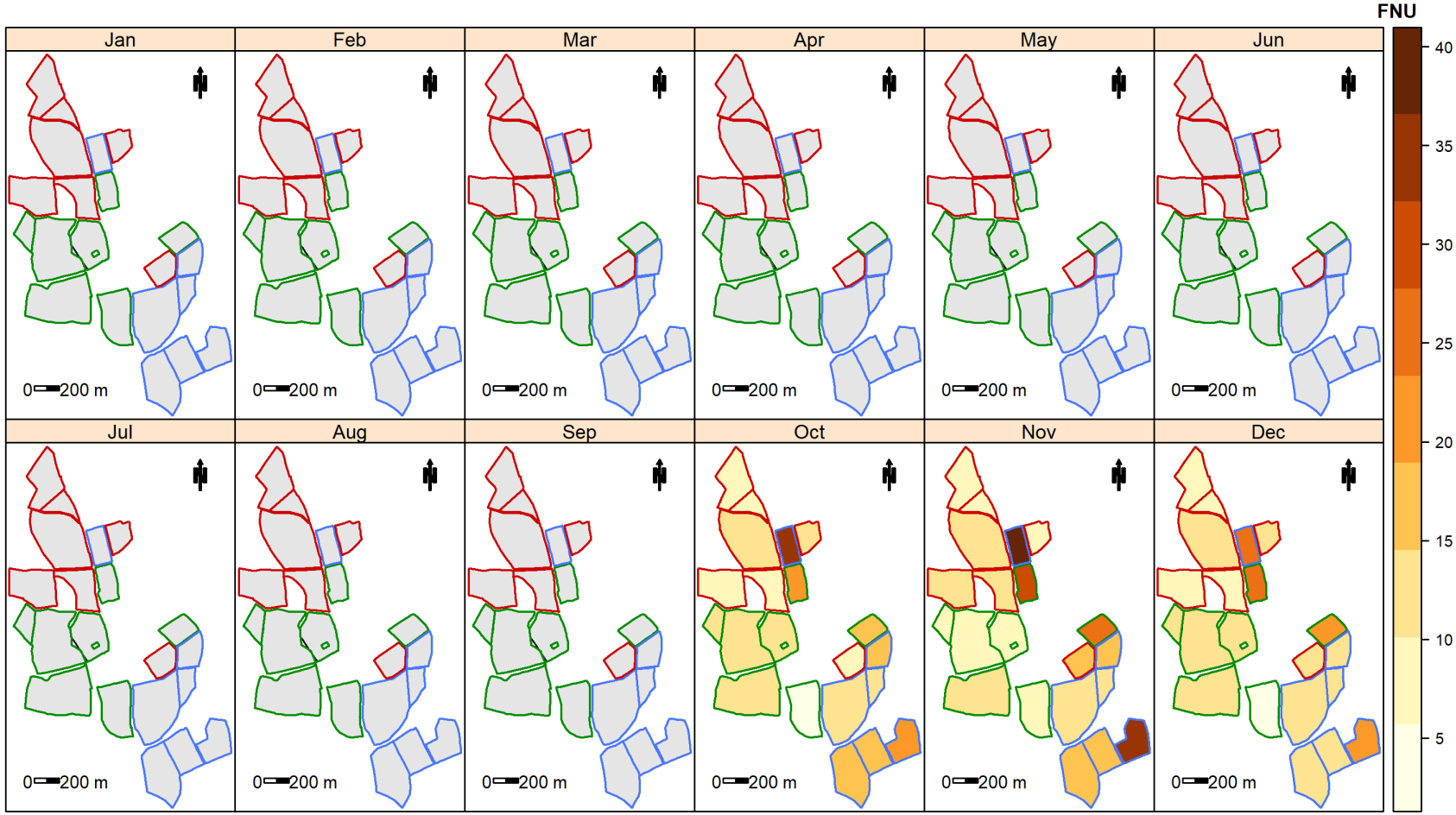


Figure 59: Mapped means for turbidity

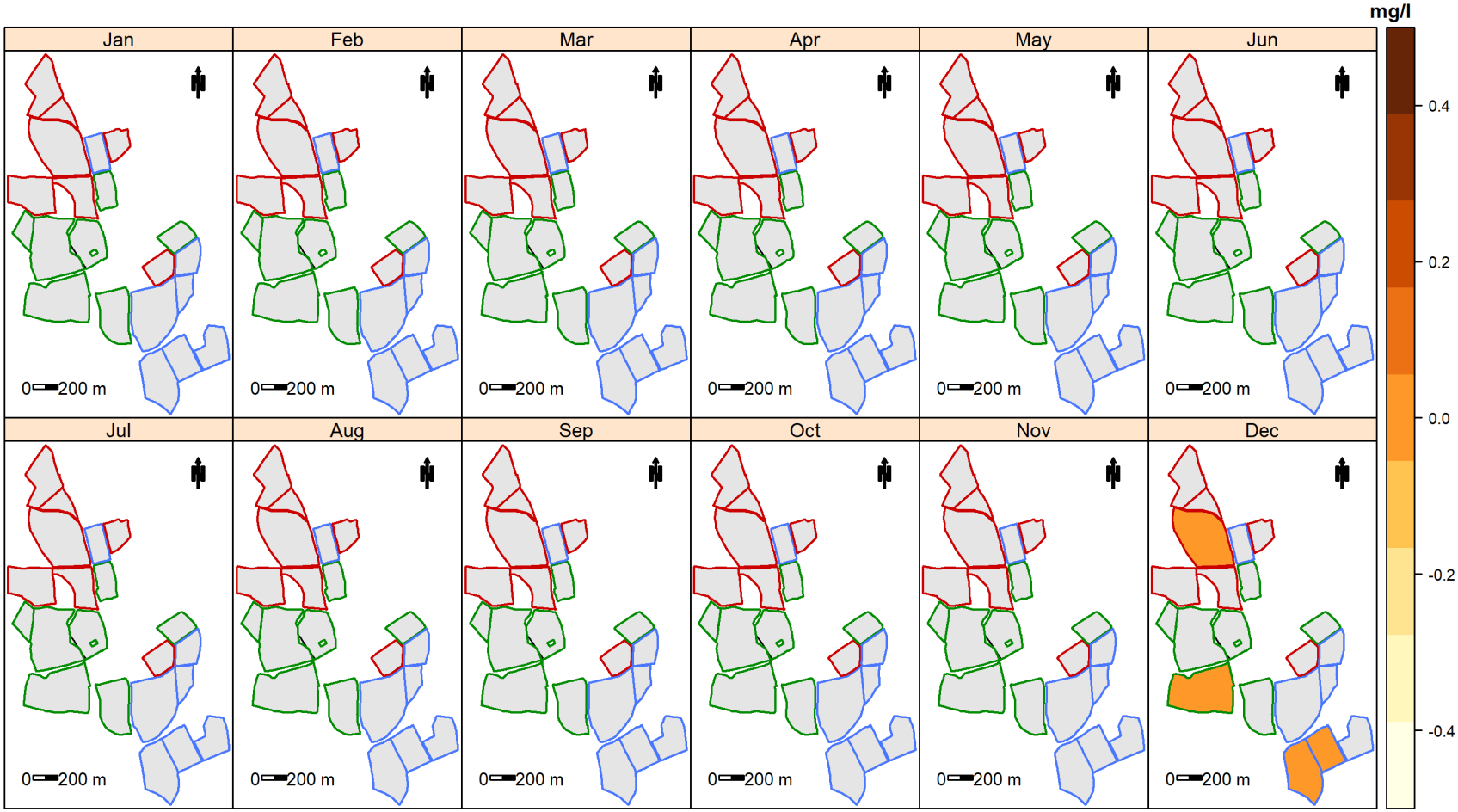


Figure 60: Mapped means for total phosphorus

No dissolved organic matter mean data available

Figure 61: Mapped means for dissolved organic matter

No ortho-phosphorus mean data available

Figure 62: Mapped means for ortho-phosphorus

2.4 Chloropleth maps of standard deviations

Grey areas represent missing data

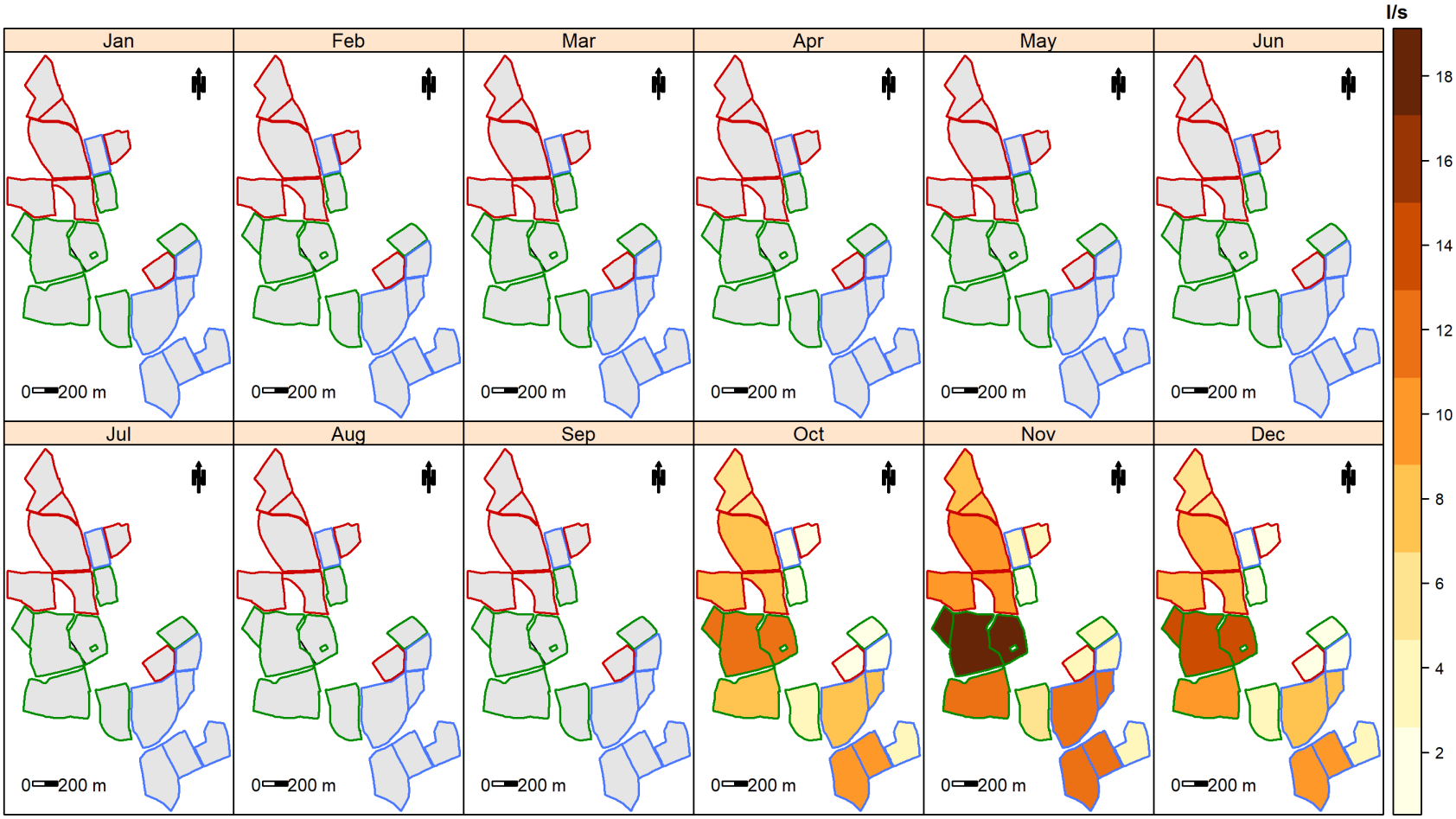


Figure 63: Mapped standard deviations for flow

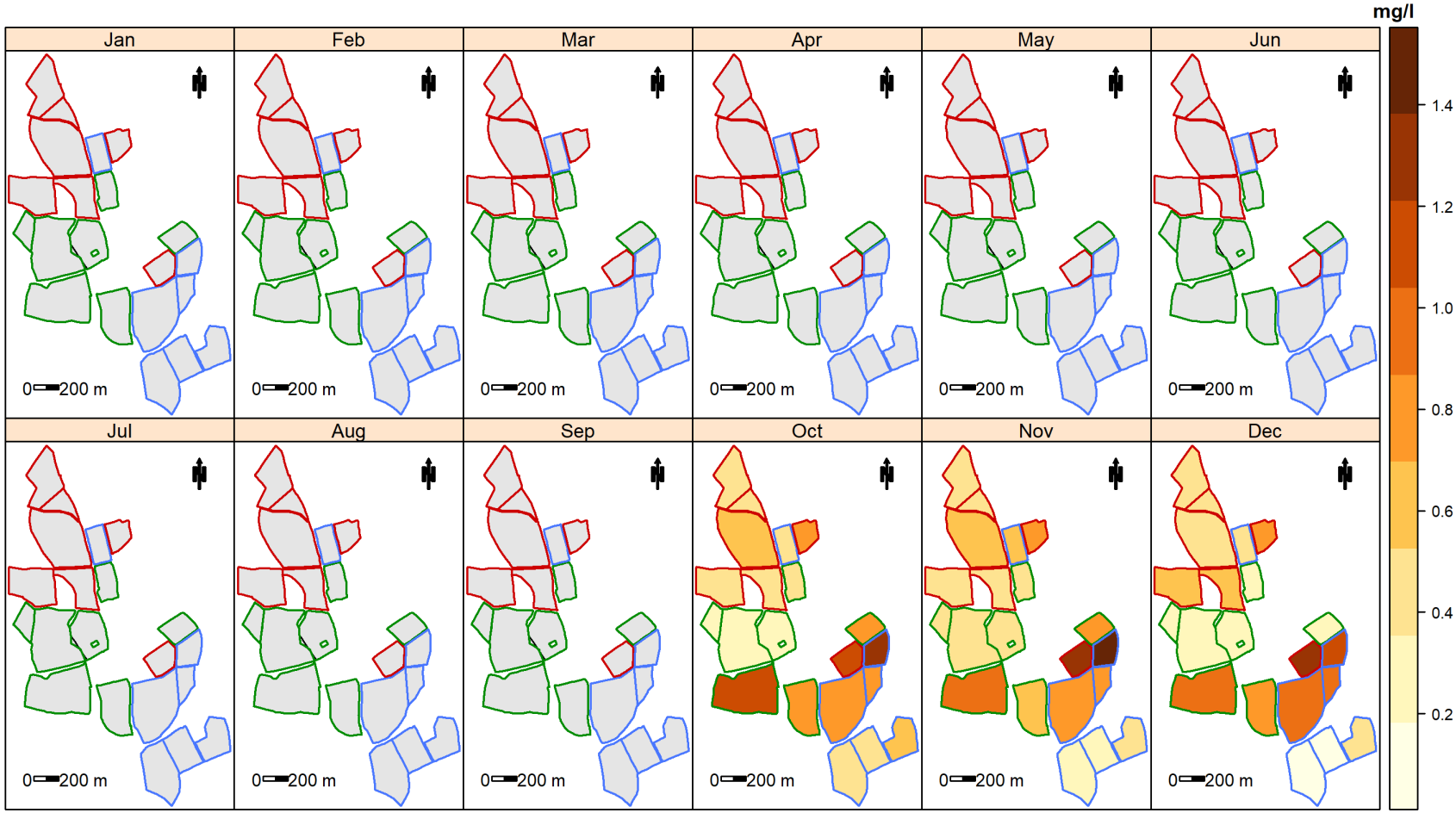


Figure 64: Mapped standard deviations for nitrate+nitrite

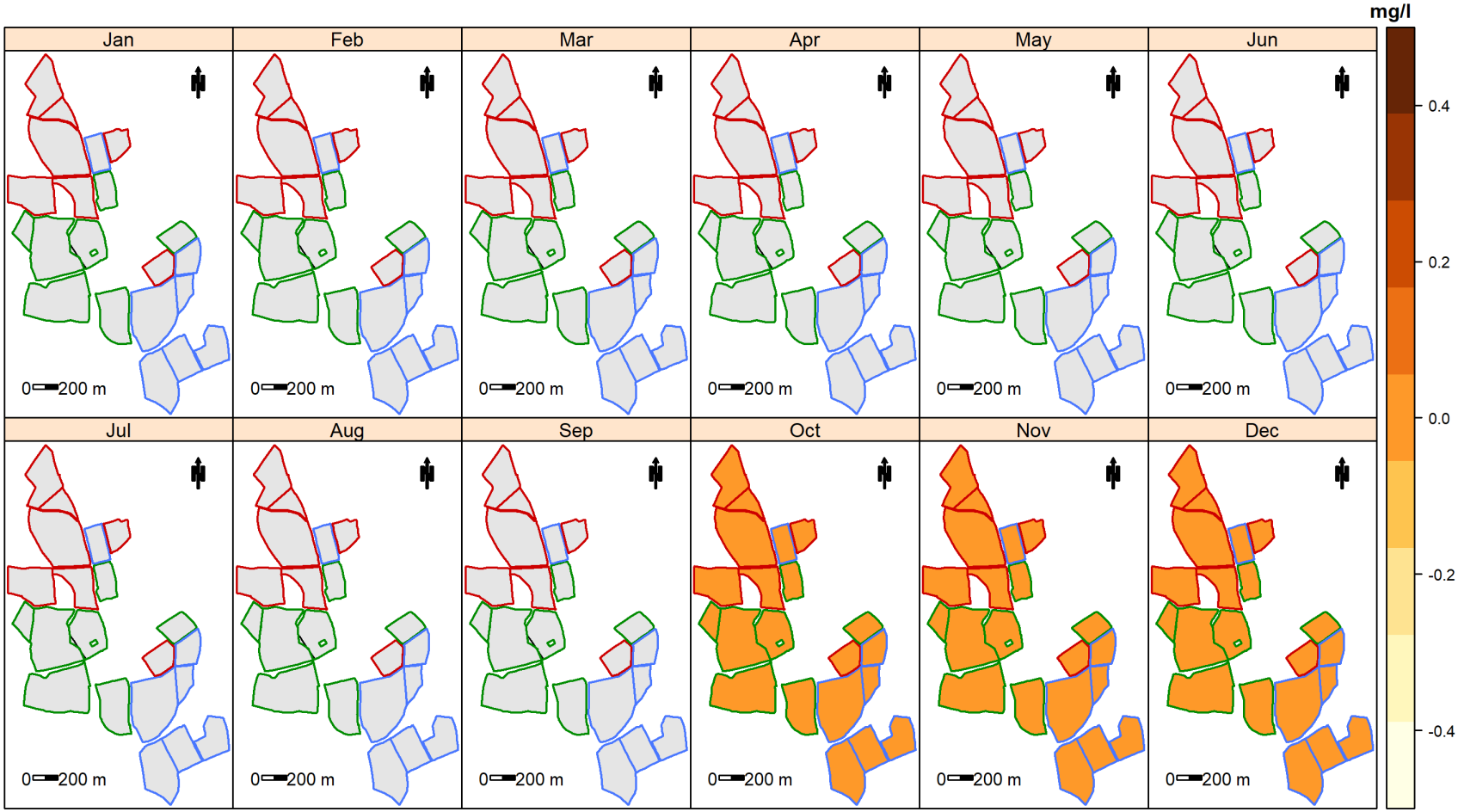


Figure 65: Mapped standard deviations for ammonia

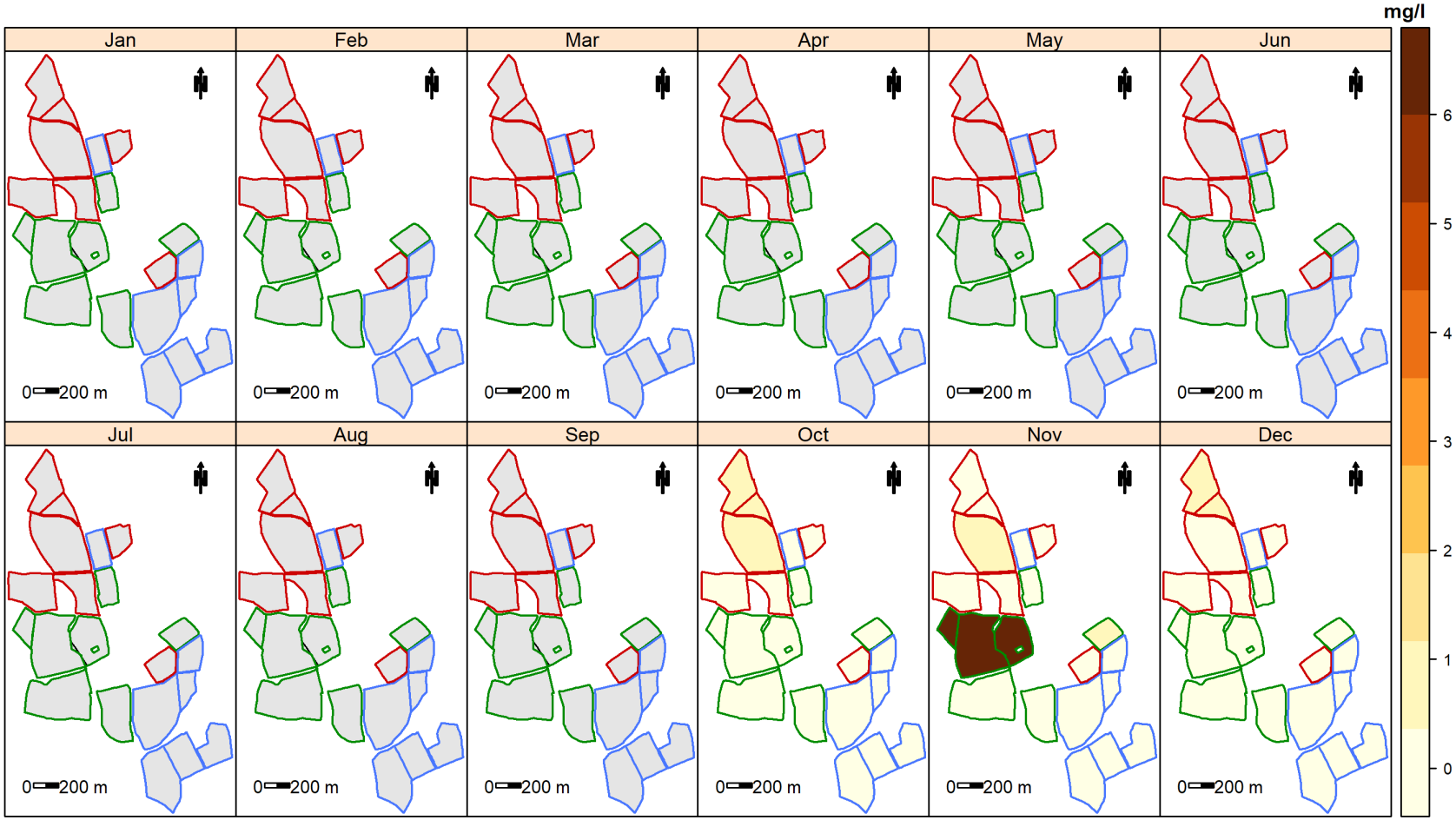


Figure 66: Mapped standard deviations for ammonium

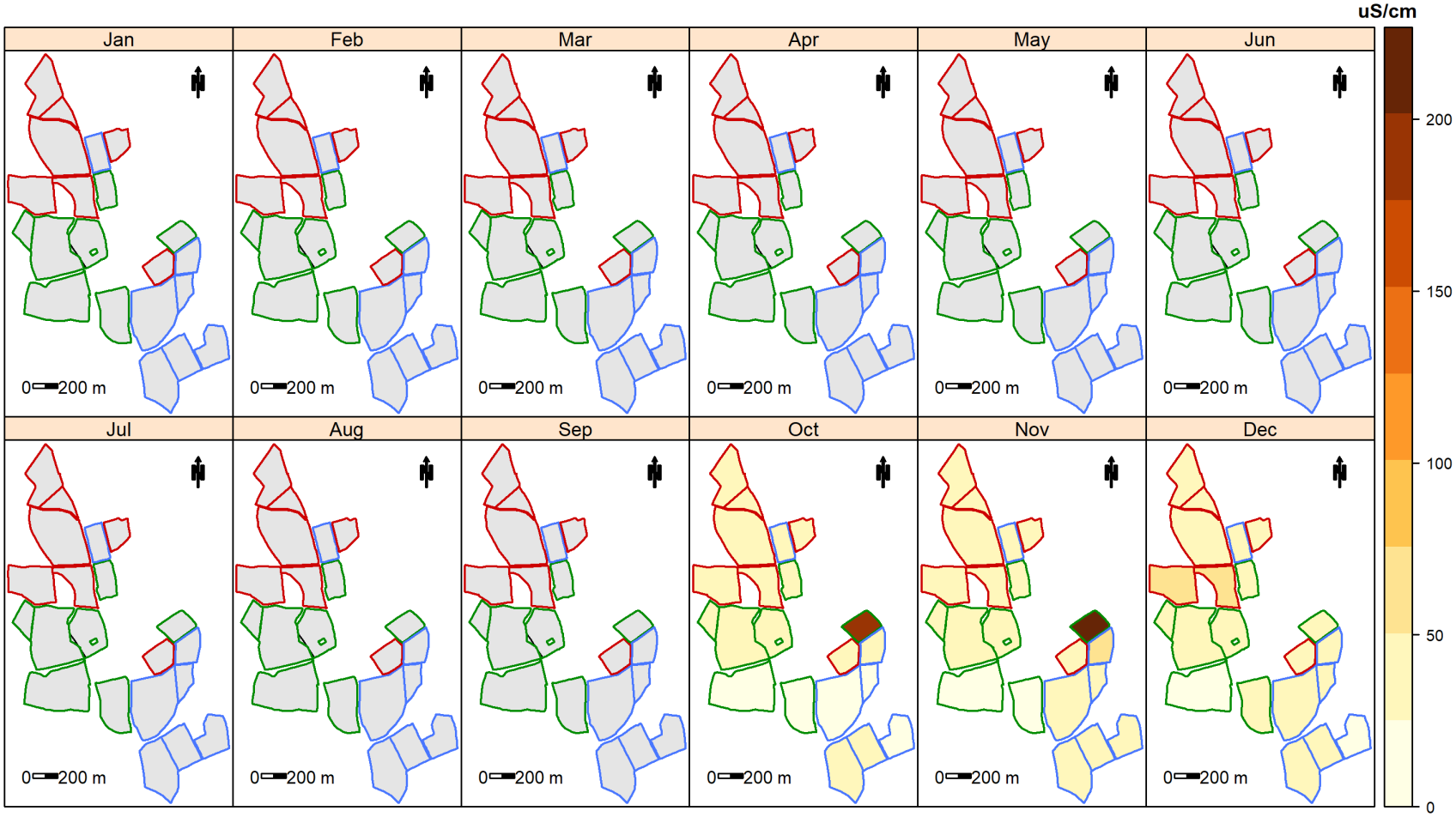


Figure 67: Mapped standard deviations for conductivity

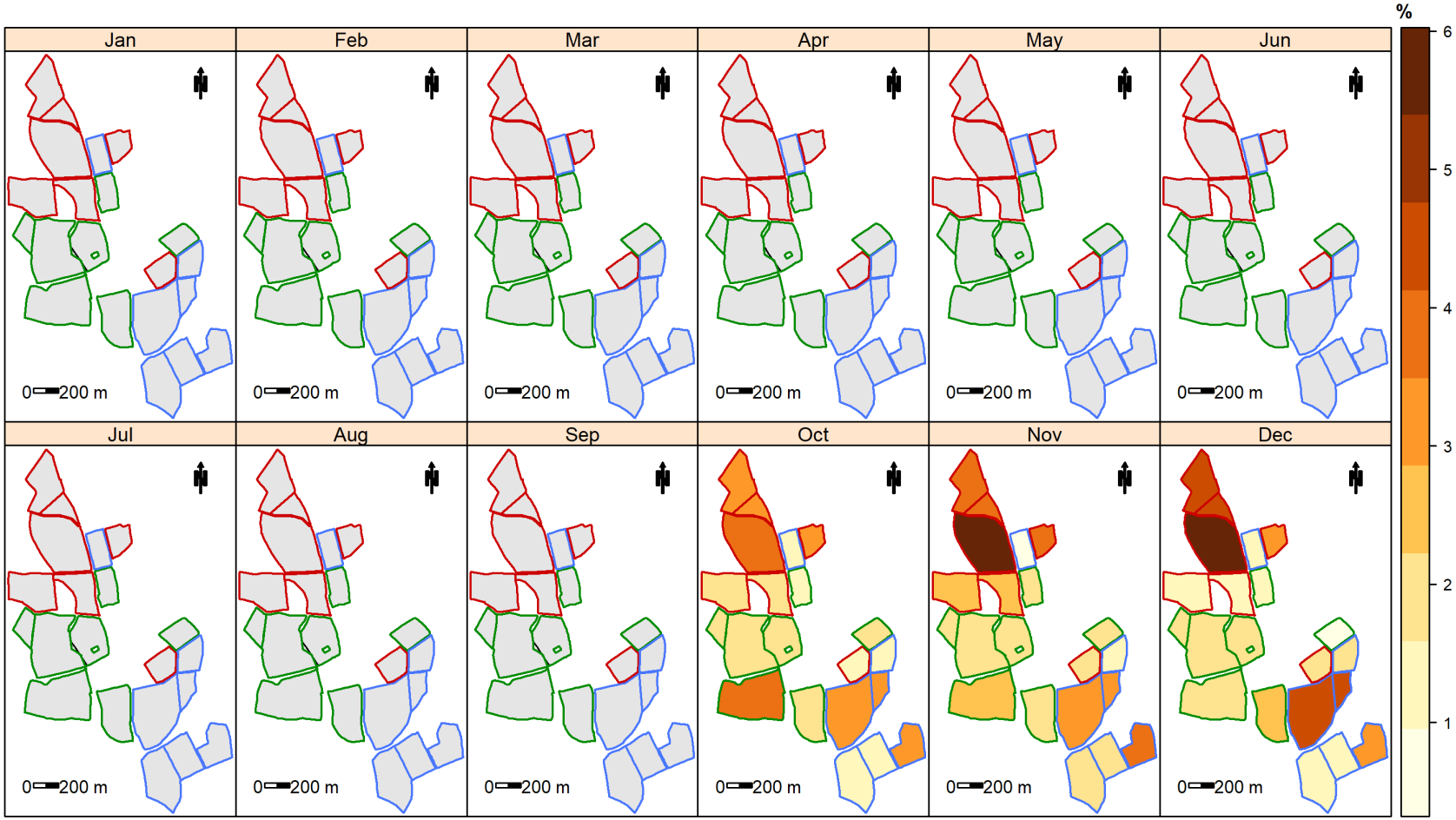


Figure 68: Mapped standard deviations for dissolved oxygen

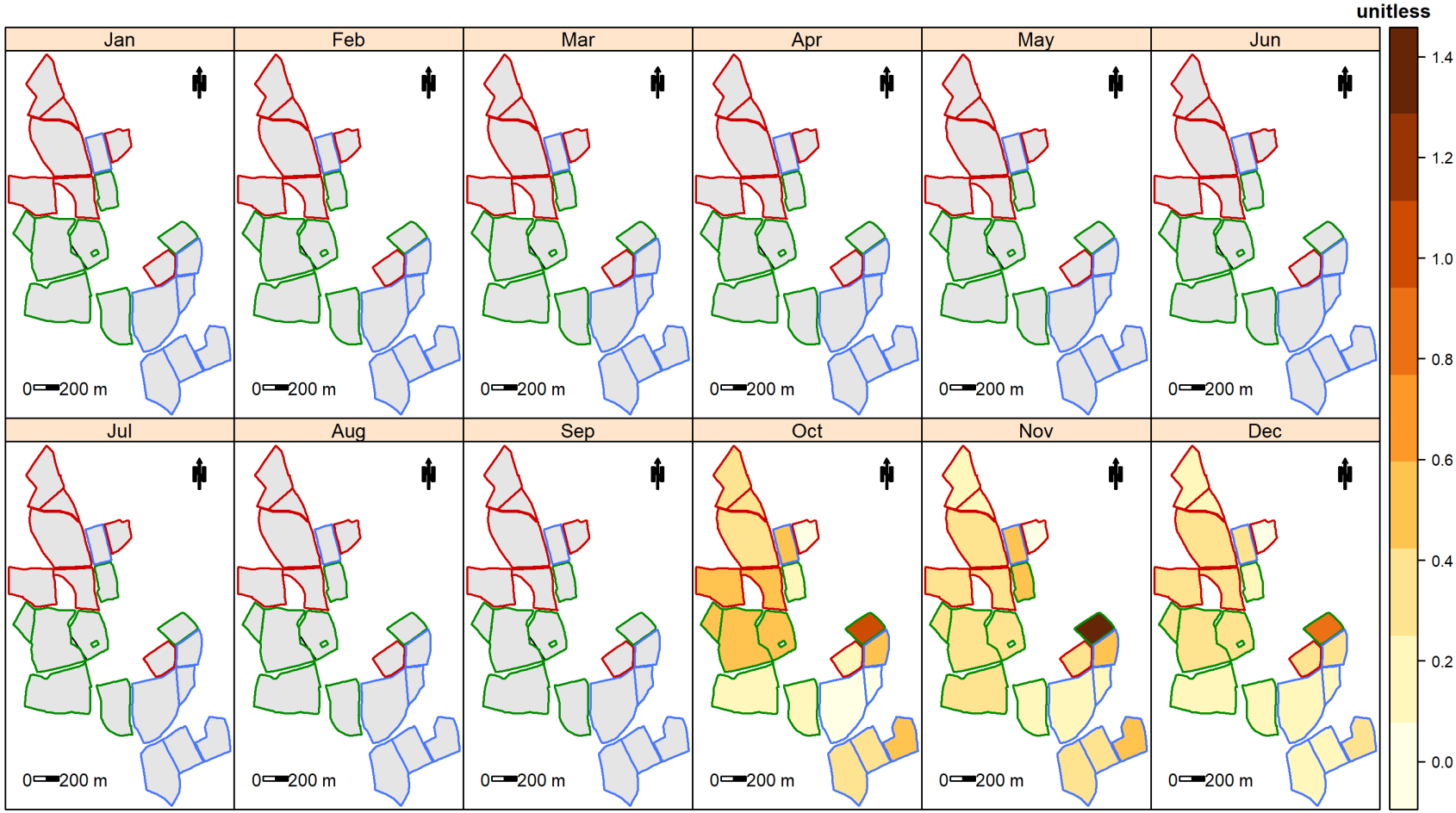


Figure 69: Mapped standard deviations for pH

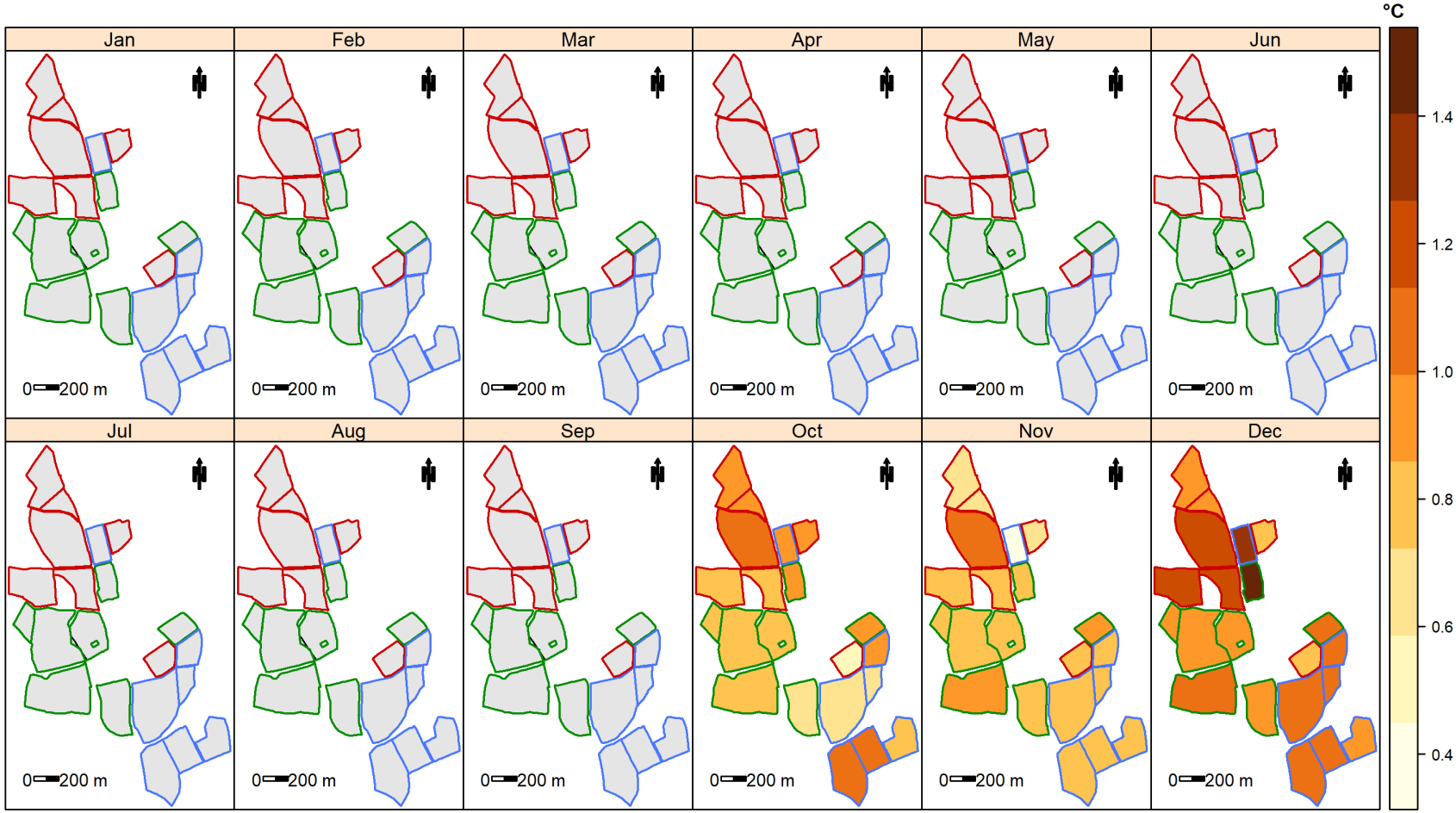


Figure 70: Mapped standard deviations for flow cell water temperature

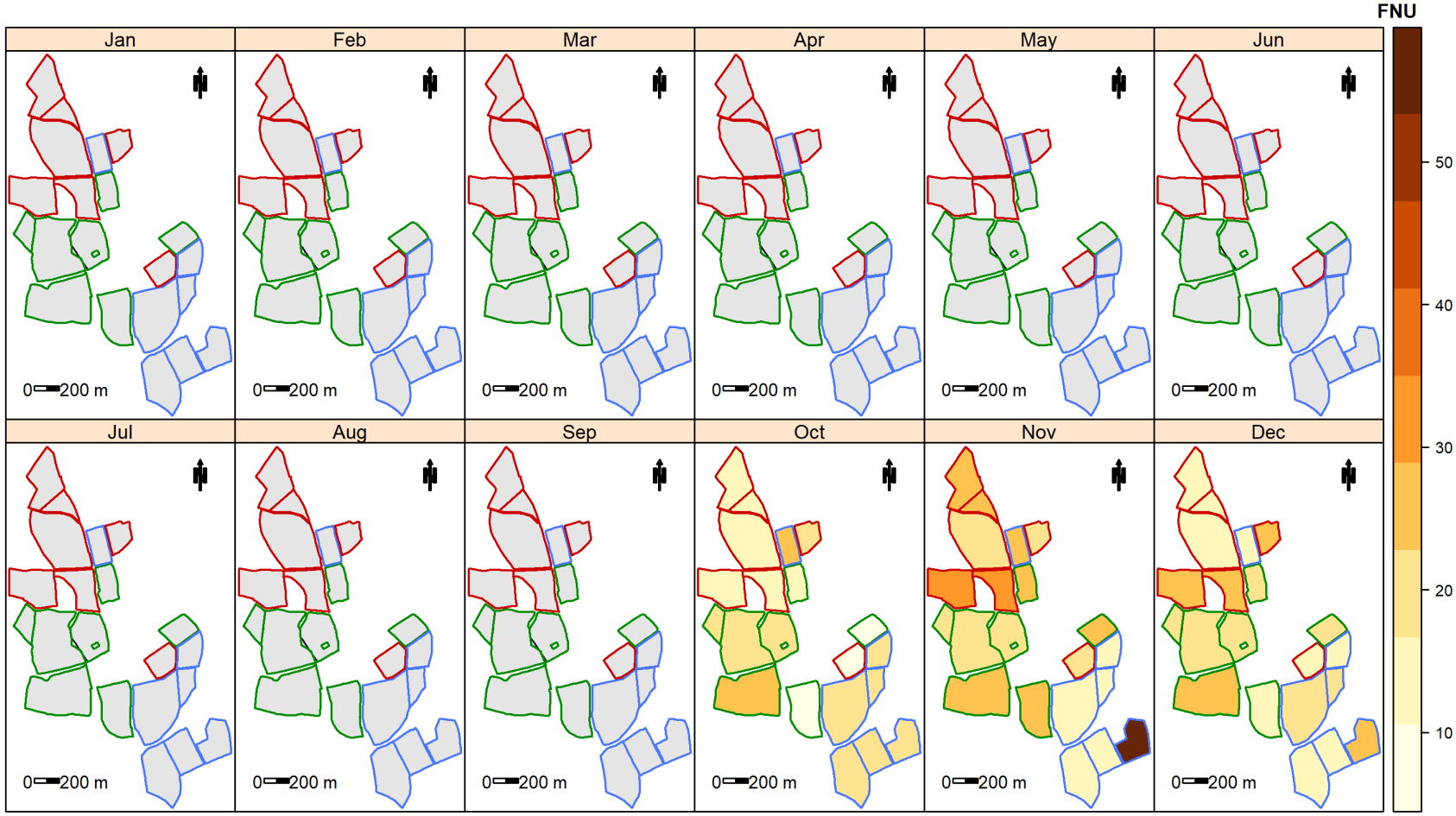


Figure 71: Mapped standard deviations for turbidity

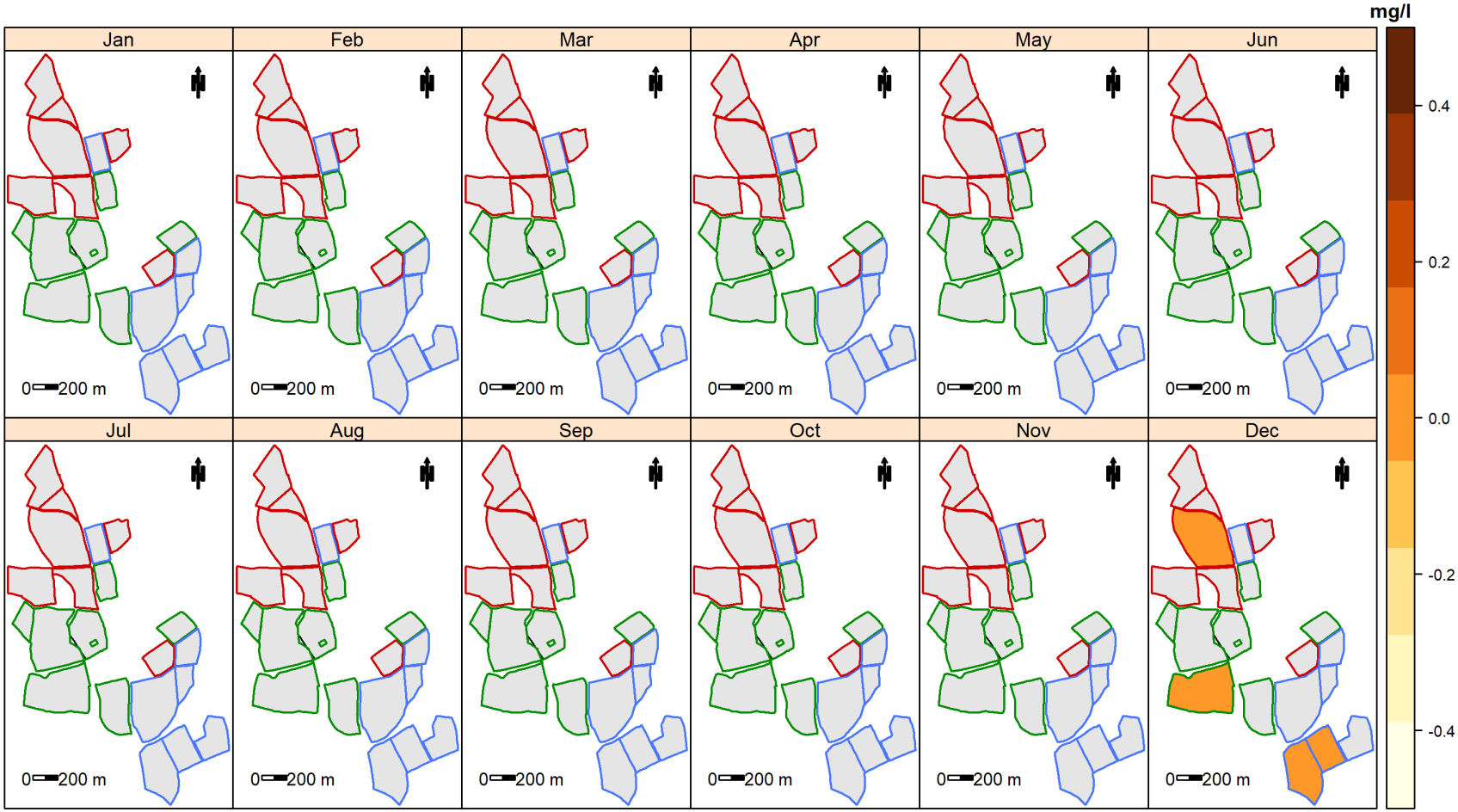


Figure 72: Mapped standard deviations for total phosphorus

No dissolved organic matter standard deviation data available

Figure 73: Mapped standard deviations for dissolved organic matter

No ortho-phosphorus standard deviation data available

Figure 74: Mapped standard deviations for ortho-phosphorus

3 ANNUAL

3.1 Summary Statistics

Please be aware that statistics are based on data that may contain missing values. Full data summaries are available on request.

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	l/s	5.2	2.9	1.1	0.4	0.5	2.2	3.0	0.8	0.5	0.6	2.5	2.8	2.4	0.5	0.6
Median	l/s	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Standard deviation	l/s	14.6	9.7	4.4	2.2	2.1	9.1	9.9	3.3	2.3	2.4	8.5	8.9	6.6	2.1	2.3
Inter-quartile range	l/s	3.0	1.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0	2.0	0.0	0.0
Coefficient of variation	l/s	2.8	3.3	4.0	5.4	4.5	4.1	3.3	4.2	4.8	3.9	3.4	3.2	2.8	4.7	4.0
Minimum	l/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	l/s	170.0	117.0	60.0	30.0	29.0	115.0	115.0	42.0	30.0	31.0	108.0	109.0	71.0	27.0	30.0
Missing values	count	26312	26304	26304	26304	26328	26309	26304	26304	26304	26304	26304	26304	26304	26307	26304
Missing values as a %	%	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75

Table 7: Annual summary statistics for flow

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	mg/l	0.5	1.8	1.1	0.5	0.3	1.8	0.1	0.8	3.1	0.3	0.7	1.0	0.8	2.7	1.3
Median	mg/l	0.0	2.0	1.0	0.0	0.0	2.0	0.0	1.0	3.0	0.0	1.0	1.0	1.0	3.0	1.0
Standard deviation	mg/l	0.5	1.1	1.2	0.8	0.4	0.9	0.3	0.6	1.3	0.5	0.6	0.5	0.6	1.3	0.8
Inter-quartile range	mg/l	1.0	2.0	2.0	1.0	1.0	1.0	0.0	1.0	2.0	1.0	1.0	0.0	1.0	2.0	1.0
Coefficient of variation	mg/l	1.0	0.6	1.1	1.6	1.6	0.5	2.5	0.7	0.4	1.6	0.8	0.5	0.7	0.5	0.6
Minimum	mg/l	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	mg/l	2.0	12.0	3.0	3.0	1.0	8.0	1.0	2.0	6.0	3.0	2.0	2.0	2.0	5.0	3.0
Missing values	count	27258	27468	28642	33609	32203	27556	29252	29182	31634	33319	28774	26909	27713	31000	28602
Missing values as a %	%	78	78	82	96	92	78	83	83	90	95	82	77	79	88	81

Table 8: Annual summary statistics for nitrate+nitrite

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	mg/l	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.2	0.0	0.0
Median	mg/l	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Standard deviation	mg/l	3.6	0.1	0.0	0.3	0.0	0.2	0.0	0.2	0.0	0.0	0.5	0.3	0.5	0.1	0.0
Inter-quartile range	mg/l	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Coefficient of variation	mg/l	11.6	10.1	NA	4.5	48.9	5.5	26.7	5.7	22.4	48.7	1.8	3.6	1.9	6.7	29.0
Minimum	mg/l	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	mg/l	98.0	1.0	0.0	3.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	1.0	3.0	1.0	1.0
Missing values	count	26491	29280	26797	33562	32745	27435	28706	29047	31610	32768	28439	27642	27421	30940	28410
Missing values as a %	%	75	83	76	96	93	78	82	83	90	93	81	79	78	88	81

Table 9: Annual summary statistics for ammonium

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	uS/cm	241.6	197.1	180.2	177.1	150.8	198.5	151.7	171.8	198.7	151.2	256.9	264.3	252.9	194.8	246.0
Median	uS/cm	244.0	202.0	188.0	127.0	158.0	214.0	163.0	175.0	214.0	151.0	279.0	279.0	262.0	209.0	266.0
Standard deviation	uS/cm	39.5	19.7	23.2	155.0	31.0	30.8	38.6	27.5	52.2	41.5	52.0	51.0	39.1	37.1	45.5
Inter-quartile range	uS/cm	28.0	11.0	11.0	87.2	43.0	27.0	50.0	26.0	65.0	68.0	67.0	72.0	31.0	45.0	38.0
Coefficient of variation	uS/cm	0.2	0.1	0.1	0.9	0.2	0.2	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Minimum	uS/cm	90.0	81.0	60.0	52.0	56.0	66.0	45.0	69.0	64.0	55.0	18.0	93.0	92.0	66.0	74.0
Maximum	uS/cm	692.0	295.0	317.0	887.0	257.0	263.0	394.0	345.0	710.0	252.0	400.0	542.0	628.0	330.0	291.0
Missing values	count	26684	29280	26797	33563	32745	27435	28706	29047	31611	32768	28567	27642	27421	30940	28410
Missing values as a %	%	76	83	76	96	93	78	82	83	90	93	81	79	78	88	81

Table 10: Annual summary statistics for conductivity

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	%	95.8	93.6	92.7	98.6	96.1	88.8	95.9	89.2	97.4	96.6	88.4	94.2	84.7	94.0	89.3
Median	%	96.0	94.0	92.0	99.0	96.0	89.0	96.0	89.0	97.0	97.0	88.0	94.0	84.0	94.0	89.0
Standard deviation	%	2.0	3.0	2.2	1.8	1.9	3.8	1.8	3.7	1.5	1.2	5.2	2.5	3.8	1.7	3.4
Inter-quartile range	%	3.0	3.0	3.0	2.0	2.0	6.0	2.0	6.0	2.0	1.0	7.0	3.0	5.0	2.0	5.0
Coefficient of variation	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Minimum	%	90.0	83.0	87.0	93.0	92.0	78.0	91.0	81.0	93.0	94.0	74.0	87.0	77.0	85.0	81.0
Maximum	%	101.0	101.0	101.0	102.0	104.0	99.0	104.0	102.0	104.0	102.0	103.0	105.0	96.0	100.0	102.0
Missing values	count	26490	29280	28206	33562	32750	27435	28706	29047	31610	32768	28439	27642	27421	30940	29137
Missing values as a %	%	75	83	80	96	93	78	82	83	90	93	81	79	78	88	83

Table 11: Annual summary statistics for dissolved oxygen

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	unitless	6.1	6.1	6.0	5.5	6.4	6.0	5.9	5.8	5.9	6.7	6.0	6.2	6.0	6.1	6.0
Median	unitless	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	7.0	6.0	6.0	6.0	6.0	6.0
Standard deviation	unitless	0.4	0.2	0.1	1.3	0.5	0.1	0.3	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.0
Inter-quartile range	unitless	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Coefficient of variation	unitless	0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Minimum	unitless	3.0	5.0	4.0	3.0	5.0	5.0	4.0	4.0	3.0	6.0	4.0	4.0	3.0	4.0	6.0
Maximum	unitless	7.0	7.0	7.0	7.0	8.0	7.0	7.0	7.0	7.0	9.0	7.0	7.0	7.0	7.0	7.0
Missing values	count	26490	29280	26797	33562	32745	27435	28706	29047	31610	32768	28439	27642	27421	30940	28410
Missing values as a %	%	75	83	76	96	93	78	82	83	90	93	81	79	78	88	81

Table 12: Annual summary statistics for pH

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	°C	9.4	9.5	9.9	8.6	9.1	9.7	8.6	8.9	9.3	8.3	8.5	9.1	9.3	9.2	9.2
Median	°C	9.0	10.0	10.0	8.0	9.0	10.0	8.0	9.0	9.0	8.0	8.0	9.0	9.0	9.0	9.0
Standard deviation	°C	2.1	2.1	1.8	1.9	2.5	1.8	2.1	2.0	2.3	2.5	2.1	2.2	2.2	2.0	2.0
Inter-quartile range	°C	3.0	4.0	3.0	3.0	4.0	3.0	3.0	4.0	4.0	3.0	3.0	4.0	3.0	4.0	2.0
Coefficient of variation	°C	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2
Minimum	°C	4.0	3.0	4.0	5.0	4.0	4.0	3.0	4.0	4.0	3.0	2.0	3.0	3.0	5.0	3.0
Maximum	°C	14.0	14.0	14.0	13.0	14.0	14.0	15.0	14.0	15.0	15.0	15.0	15.0	15.0	13.0	15.0
Missing values	count	26490	29280	26797	33562	32745	27435	28706	29047	31610	32768	28439	27642	27421	30940	28410
Missing values as a %	%	75	83	76	96	93	78	82	83	90	93	81	79	78	88	81

Table 13: Annual summary statistics for flow cell water temperature

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	FNU	9.6	12.1	5.8	23.2	26.0	11.2	14.7	24.4	14.1	29.8	12.1	9.4	8.8	11.9	11.3
Median	FNU	4.0	5.0	1.0	20.0	20.0	6.0	11.0	16.0	9.0	24.0	8.0	4.0	5.0	7.0	4.0
Standard deviation	FNU	19.2	25.5	16.7	20.3	19.1	16.4	16.1	36.2	14.5	19.9	16.1	23.1	19.3	15.3	22.4
Inter-quartile range	FNU	7.0	9.0	5.0	19.0	17.0	10.0	11.0	17.0	11.0	15.0	10.0	6.0	8.0	12.0	10.0
Coefficient of variation	FNU	2.0	2.1	2.9	0.9	0.7	1.5	1.1	1.5	1.0	0.7	1.3	2.5	2.2	1.3	2.0
Minimum	FNU	0.0	0.0	0.0	0.0	1.0	1.0	1.0	3.0	0.0	6.0	0.0	0.0	1.0	0.0	0.0
Maximum	FNU	539.0	609.0	445.0	317.0	211.0	368.0	328.0	597.0	289.0	213.0	429.0	401.0	974.0	191.0	373.0
Missing values	count	26490	29280	26952	33562	32745	27435	28706	29047	31610	32768	28441	27642	27421	30940	28410
Missing values as a %	%	75	83	77	96	93	78	82	83	90	93	81	79	78	88	81

Table 14: Annual summary statistics for turbidity

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	mg/l	NA	0.0	NA	NA	NA	NA	0.0	NA	NA	NA	0.0	NA	NA	NA	NA
Median	mg/l	NA	0.0	NA	NA	NA	NA	0.0	NA	NA	NA	0.0	NA	NA	NA	NA
Standard deviation	mg/l	NA	0.0	NA	NA	NA	NA	0.0	NA	NA	NA	0.0	NA	NA	NA	NA
Inter-quartile range	mg/l	NA	0.0	NA	NA	NA	NA	0.0	NA	NA	NA	0.0	NA	NA	NA	NA
Coefficient of variation	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum	mg/l	NA	0.0	NA	NA	NA	NA	0.0	NA	NA	NA	0.0	NA	NA	NA	NA
Maximum	mg/l	NA	0.0	NA	NA	NA	NA	0.0	NA	NA	NA	0.0	NA	NA	NA	NA
Missing values	count	35135	33895	35135	35135	35135	35135	33901	35135	35135	35135	33798	35135	35135	35135	35135
Missing values as a %	%	100	96	100	100	100	100	96	100	100	100	96	100	100	100	100

Table 15: Annual summary statistics for total phosphorus

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	ug/l QSU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Median	ug/l QSU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard deviation	ug/l QSU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inter-quartile range	ug/l QSU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of variation	ug/l QSU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum	ug/l QSU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Maximum	ug/l QSU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Missing values	count	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135
Missing values as a %	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 16: Annual summary statistics for dissolved organic matter

		Catchment Number														
Variable		**Green**					**Blue**					**Red**				
	units	**4**	**5**	**6**	**12**	**13**	**9**	**8**	**7**	**11**	**14**	**2**	**3**	**1**	**10**	**15**
Mean	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Median	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard deviation	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inter-quartile range	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of variation	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Maximum	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Missing values	count	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135	35135
Missing values as a %	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 17: Annual summary statistics for ortho-phosphorus

4 APPENDIX

4.1 Hydrological areas - Catchments

	Catchment Number														
	Green					Blue					Red				
	4	5	6	12	13	9	8	7	11	14	2	3	1	10	15
pre-13/08/2013	11.6	6.7	4.0	1.9	1.8	7.9	7.3	2.7	1.8	1.8	6.8	6.8	5.0	1.9	1.6
post-13/08/2013	8.1	6.7	4.0	1.9	1.8	7.9	7.3	2.7	1.8	1.8	6.8	6.8	5.0	1.9	1.6

Table 18: Catchment hydrological areas (ha) pre- and post- change to area of Catchment 4 on 13th August 2013

4.2 Hydrological areas - Farmlets

	Green	Blue	Red
pre-13/08/2013	25.9	21.6	22.2
post-13/08/2013	22.4	21.6	22.2

Table 19: Farmlet hydrological areas (ha) pre- and post- change to area of Catchment 4 on 13th August 2013